DOCUMENT RESUME

ED 186 210 SE 030 340

AUTHOR Guay, Julian
TITLE Biology and Life Science Classroom Teaching Environment in Southern Alberta.
INSTITUTION Lethbridge Univ. (Alberta).
SPONS AGENCY Alberta Advisory Committee for Educational Studies, Edmonton.
PUB DATE Jan 80
NOTE 203p.

EDRS PRICE MF01/PC09 Plus Postage.
DESCRIPTORS *Biological Sciences; Biology; *Comparative Analysis; Educational Research; High Schools; Junior High Schools; *Rural Urban Differences; Science Education; *Science Facilities; Science Programs; Science Teachers; Secondary Education; *Secondary School Science
IDENTIFIERS Alberta

ABSTRACT

This study provides information about the biology and life science classroom teaching environments in Southern Alberta. Responses (N=53) to questionnaires sent to junior and senior high school teachers in rural and urban settings revealed information regarding school facilities, texts and reference materials, field trips, outdoor education facilities, academic background of the teachers, teacher interest in establishing a regional biology/life science teachers' organization, and interest in working with science education students in field experiences. Results evaluated by tabulation of response frequencies and calculation of means, ranges, and percentages are presented in 82 tables. Generalizations include: (1) urban teachers reported more specialized teaching assignments, larger class enrollments, and more science-related options available than did those in rural settings; and (2) laboratory facilities and the requisite instructional materials were better supplied to senior high school levels than to junior high levels, especially in urban settings. Other urban-rural and junior high-senior high differences are described. Several aspects of the classroom environment were delineated by the survey respondents as needing improvement. (Author/CS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED186210

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Julian Guay

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BIOLOGY AND LIFE SCIENCE CLASSROOM TEACHING ENVIRONMENT IN SOUTHERN ALBERTA

Julian Guay

University of Lethbridge

Lethbridge, Alberta

January, 1980

SE 030 340

ACKNOWLEDGEMENTS

This study was supported in part by a grant from the Alberta Advisory Committee on Educational Studies (AACES) and by assistance from The University of Lethbridge Faculty of Education Research Centre.

TABLE OF CONTENTS

	Page
Acknowledgements	ii
Table of Contents	iii
List of Tables	v
Abstract	1
Introduction	2
Method	3
Results	5
Teaching assignments	5
Class size	6
Texts	7
Visual aids	8
Charts	8
Films	9
Filmstrips and film loops	9
Microscope slides	9
Photos	9
Slides	10
Transparencies	10
Laboratory equipment and supplies	10
Aquarium	10
Centrifuge	11
Chemicals	11
Dissecting kits and trays	11

Page

Fire extinguishers 11
First aid kit 12
Gas burner 12
Glassware 12
Heating oven 12
Incubator 12
Microscopes 13
Models 13
Plastic mounts 13
Refrigerators 13
Sinks 14
Slide mounting equipment 14
Specimens 14
Terrarium 15
Water bath 15
Laboratory/classroom facilities 15
Field trips 18
Outdoor education 19
Workshops 20
Regional biology/life science organization 21
Field experience assistance 21
Teacher training and experience 22
Discussion 27
References 34
Appendix A Tables of Results 37
Appendix B Map of Zone 6 in Alberta 122

LIST OF TABLES

Table		Page
1	Teaching levels and locations for survey respondents	38
2	Age and sex of respondents	39
3	Teaching level and number of subjects taught other than biology and/or life science	40
4	Courses and enrollments in other subject areas - senior level in rural locations	41
5	Courses and enrollments in other subject areas - combined junior and senior level in rural locations	42
6	Courses and enrollments in other subject areas - junior level in urban locations	43
7	Courses and enrollments in other subject areas - junior level in independent urban location	44
8	Courses and enrollments in other subject areas - junior level in rural locations	45
9	Courses and enrollments in biology and life sciences	46
10	Evaluation of texts used	48
11	Evaluation of available reference materials	50
12	Availability and quality of materials - charts	51
13	Availability and quality of materials - films	52
14	Availability and quality of materials - filmstrips and loops	53
15	Availability and quality of materials - microscope slides	54
16	Availability and quality of materials - photos	55
17	Availability and quality of materials - slides	56
18	Availability and quality of materials - transparencies	57

Table		Page
19	Availability and quality of equipment and supplies - aquarium	58
20	Availability and quality of equipment and supplies - centrifuge	59
21	Availability and quality of equipment and supplies - chemicals	60
22	Availability and quality of equipment and supplies - dissecting kits	61
23	Availability and quality of equipment and supplies - dissecting trays	62
24	Availability and quality of equipment and supplies - fire extinguisher	63
25	Availability and quality of equipment and supplies - first aid kit	64
26	Availability and quality of equipment and supplies - gas burner	65
27	Availability and quality of equipment and supplies - glassware	66
28	Availability and quality of equipment and supplies - heating oven	67
29	Availability and quality of equipment and supplies - incubator	68
30	Availability and quality of equipment and supplies - dissecting microscopes	69
31	Availability and quality of equipment and supplies - monocular microscopes	70
32	Availability and quality of equipment and supplies - models	71
33	Availability and quality of equipment and supplies - plastic mounts	72
34	Availability and quality of equipment and supplies - refrigerator	73
35	Availability and quality of equipment and supplies - sinks	74

Table		Page
36	Availability and quality of equipment and supplies - slide mounting equipment	75
37	Availability and quality of equipment and supplies - live animal specimens	76
38	Availability and quality of equipment and supplies - preserved animal specimens	77
39	Availability and quality of equipment and supplies - live plant specimens	78
40	Availability and quality of equipment and supplies - preserved plant specimens	79
41	Availability and quality of equipment and supplies - terrarium	80
42	Availability and quality of equipment and supplies - water bath	81
43	Room location of biology and/or life science classes	82
44	Availability and quality of laboratory facilities - space	83
45	Number of work stations available	84
46	Average number of students per work station	85
47	Availability and quality of laboratory facilities - work stations	86
48	Availability and quality of laboratory facilities - work station air outlet	87
49	Availability and quality of laboratory facilities - work station gas outlet	88
50	Availability and quality of laboratory facilities - work station water outlet	89
51	Availability and quality of laboratory facilities - work station sink	90
52	Availability and quality of laboratory facilities - demonstration desk	91
53	Availability and quality of laboratory facilities - chalkboards	92

Table		Page
54	Availability and quality of laboratory facilities - lighting	93
55	Availability and quality of laboratory facilities - outside windows	94
56	Availability and quality of laboratory facilities - ventilation	95
57	Availability and quality of laboratory facilities - room temperature control	96
58	Availability and quality of laboratory facilities - storage facilities	97
59	Availability and quality of laboratory facilities - facilities for housing live animals	98
60	Annual operating budget for laboratory	99
61	Number of field trips per school year	100
62	Preference for additional field trips	101
63	Annual budget allotment for field trips	102
64	Nature of field trips	103
65	Outdoor education programs related to biology and/or life sciences	104
66	Interest in workshop participation	105
67	Suggested workshop topics	106
68	Regional biology/life science organization	107
69	Interest in working with field experience students	108
70	Teachers interested in working with field experience students	109
71	Years of teaching experience	110
72	Years of teacher education	111
73	Degrees held by biology/life science teachers	112
74	Institution of training	113
75	Teaching majors	114

Table		Page
76	Training in biology methods and interest in further study	115
77	Number of semesters training in biology and related areas	116
78	Courses in biology and related areas reported by senior level teachers in rural locations	117
79	Courses in biology and related areas reported by senior level teachers in urban locations	118
80	Courses in biology and related areas reported by junior - senior level teachers in rural locations	119
81	Courses in biology and related areas reported by junior level teachers in urban locations	120
82	Courses in biology and related areas reported by junior level teachers in rural locations	121

ABSTRACT

The purpose of this study was to provide systematic information about the biology and life science classroom teaching environments in Southern Alberta. Fifty-five teachers in these settings, approximately one-third of those contacted, responded to the questionnaire. Urban teachers reported more specialized teaching assignments, larger class enrollments, and more science-related options available than did those in rural settings. Laboratory facilities and the requisite instructional materials were better supplied to senior high school levels, than to junior, especially in urban settings. Other urban-rural and junior high-senior high differences were described. Several aspects of the classroom environments were delineated by the survey respondents as needing improvement.

BIOLOGY AND LIFE SCIENCE CLASSROOM TEACHING ENVIRONMENT IN SOUTHERN ALBERTA

This study was prompted by the lack of systematic information about the biology and life science classroom teaching environments in Zone 6 in Alberta. Information was sought about teachers in biology and life science, and about instructional facilities for these courses. The aims of the study were to determine which courses were being taught in these two subject areas and to ascertain needs for improvement in facilities, texts, references, and curricula. Secondary goals were to discover areas in which teachers desired further study, and to learn what academic background they deemed necessary to adequately fulfill the teaching obligations in biology and life science courses.

METHOD

A questionnaire was mailed to the 157 teachers of biology and life science in Zone 6. Approximately one-third (55) of the teachers returned completed questionnaires. The teaching levels and locations of the survey respondents are reported in Table 1 in Appendix A. Most of the respondents (84%) were males. Sixty per cent of the respondents were 35 years of age or less. In the youngest age group, 21 to 25 years, there was a greater proportion of female teachers than in other categories. In this group approximately 40% were female. Data on the age and sex of respondents are in Table 2 in Appendix A.

The following information was requested in the survey:

1. Name, number, and enrollments of classes, quality of texts and references used, quality and description of facilities available, number and nature of field trips in conjunction with classes, and availability and desirability of outdoor education classes;
2. The academic background and number of years of teaching experience of the teacher, and an indication of interest in future study through workshops, methodology courses, or graduate study;
3. Interest in the establishment of a Southern Alberta regional biology/life science teachers' organization;
4. Interest in working with University of Lethbridge biology and life science education students in field experiences.

Since this was a descriptive survey, hypothesis testing was a lower priority than exploring answers to questions such as:

1. What science facilities are lacking or need improvement in the schools?
2. What is the number and nature of field trips in urban areas as compared with those in rural areas?
3. What different academic preparation may be required for teaching in urban as compared to rural areas?
4. What opportunities might exist for expansion of University of Lethbridge field experience placements into additional rural areas?

Some of the hypotheses to be tested were:

1. Senior high school teachers have a more extensive post-secondary academic background than do junior high school teachers.
2. Teachers at senior levels are assigned more specialized teaching loads.
3. Teachers in the rural areas have a greater variety of subject matter included in their teaching assignments.
4. Urban life science facilities are more adequate and better equipped than rural facilities.

Results were evaluated by tabulation of response frequencies and calculations of means, ranges, and percentages. Qualitative information was subjected to content analyses. Tables of results are presented in Appendix A.

RESULTS

Teaching Assignments

Teachers of biology and life science courses in urban locations reported more specialized instructional assignments than their rural counterparts, especially at the senior high level. At this level all urban respondents reported teaching only biology and life science-related courses. Only one of six rural senior high teachers and one of the thirteen teachers in combined junior-senior rural locations could make this claim. The senior high school teachers in rural areas taught up to four other subjects in addition to biology and life science (M=2). The teachers in rural combined junior-senior high schools averaged three other subjects, with a range from zero to six.

The trend of less specialization at the lower grade levels was demonstrated in teaching assignments for junior high schools, although urban locations still were favored. The urban junior high teachers averaged two subjects other than biology, life science or related courses, with a range from zero to five. Even at this lower level in urban schools two of the twelve teachers reported teaching only in their specialty. The average number of additional subjects for rural junior high teachers was five, with a range from one to nine or more. Data on grade level and number of instructional subjects other than biology or life science are presented in Table 3.

The trend for increasing specialization at the senior levels and in the urban areas was also evident from an examination of the nature of the subjects included in the teaching assignments of biology

and life science teachers. Subjects most likely to be combined for biology teachers in the rural senior high schools were chemistry and mathematics, with English and literature the next most common (see Table 4). For combined junior-senior rural schools, other sciences were the most likely subjects to be assigned to biology and life science teachers. Physics, chemistry, earth science, physical science and science-related options were all frequently reported (see Table 5). The tendency to assign other science-related subjects to life-science teachers was also apparent in the junior high schools in urban locations (see Tables 6 and 7). In rural junior high locations almost every subject in the curriculum was included in at least one teacher's assignment (see Table 8).

Class Size

Urban classes generally tended to be larger than rural classes. Urban classes ranged from 5% to 50% larger in all life science and biology courses and options, with the exception of Science 11. In this class, enrollments in the rural areas averaged from 10 to 25% larger than in urban classes. Class sizes in urban junior high life science averaged 29 students; mean class sizes for related options ranged from 17 to 33. Rural junior high life science classes averaged 24 to 27 students; mean class sizes in related options were 15 to 27. Fewer life science-related options were available in rural locations. Data for biology and life science enrollments appear in Table 9.

Class enrollments in biology gradually decreased in higher grade levels. The decrease was more marked in rural areas. The urban senior highs averaged two Biology 10, 1.25 Biology 20 and 1.25 Biology 30 classes per

teacher. Mean enrollments were 24 to 28 students per class. While class sizes fluctuated over the three levels, decreased enrollment was evident in that fewer classes were offered at the higher levels. A greater decline in enrollments for these courses was present in rural locations. In rural senior high schools fewer classes were offered at the higher levels and average enrollments diminished from 26 at the Grade 10 level to 19 by Grade 12. Combined junior-senior biology teachers reported no decrease in the number of 10, 20 and 30 classes offered (with approximately one of each available) but there was a decline in average class size from 26 to 17.

Texts

The curricula for Biology 10 to 30 and Life Science recommend the usage of several texts. Respondents in this study reported that Thurber and Kilburn's *Exploring Life Science* was the text most frequently used. It was rated excellent or adequate by less than fifty per cent of those indicating its use. Over half of the teachers described it as unsatisfactory for their purposes. Ehrenfeld's *Biological Conservation* was similarly rated. The Nuffield Foundation texts were viewed as only slightly better. Data on text evaluation is reported in Table 10.

Investigation of Cells and Organisms by Abramoff and Thompson was reported as adequate for classroom use, as was McElroy et al., *Foundations of Biology*. The Wong and Dolmatz text, BSCS Green and Yellow Versions, and Otto and Towle's *Modern Biology* were rated adequate to excellent. Another text frequently utilized was Brandwein et al., *Life, Its Forms and Changes*. This was also rated as adequate to excellent.

At least thirty different books were reported to be in use for supplementing the regular offerings. This may continue to be a necessary procedure until more adequate selections can be incorporated into curriculum recommendations.

The availability of adequate reference materials was a problem for both urban and rural teachers at all levels. Approximately one-half of the teachers in each type of location reported insufficient quantities and an inadequate variety of reference materials for classroom usage. The depth of available materials was unsatisfactory in approximately 25% of the cases. The accuracy of materials was generally adequate (see Table 11).

Improvement of text and reference quality and availability seemed to be a concern common to all grade levels and both urban and rural locations.

Visual Aids

In general, the availability of audio-visual materials was slightly better for urban than for rural teachers. Senior level teachers frequently reported better supplies of this type than did junior high teachers.

Charts. Seventy-eight per cent of all respondents reported that a supply of charts was available. In general, the quantity available and the quality of charts was indicated to be adequate at the senior and combined junior-senior high levels in both locations. More than 50% of the junior high teachers reported insufficient charts for instruc-

tional purposes. Those charts available were usually rated as adequate quality. These and photos were the only visuals described as better-supplied for rural junior highs than for urban (see Table 12).

Films. Films were reported available for 76% of the teachers. A greater proportion of urban junior and senior high teachers had access to films than did rural teachers at the same levels. At the combined rural junior-senior high and the urban junior high levels, the supply of films was considered adequate by the majority of teachers. Half or more of the remaining groups of teachers found the quantities unsatisfactory. The films that were available were usually rated as being of adequate quality (see Table 13).

Filmstrips and film loops. Three-quarters of the teachers indicated that filmstrips and film loops were available to them for classroom instruction. Approximately 45% described quantities as adequate or excellent. Insufficient quantities existed in about 40% of the cases. Two-thirds of the rural junior high school teachers reported unsatisfactory quantities of filmstrips and film loops. This same group frequently rated the quality as unsatisfactory (see Table 14).

Microscope slides. Nearly 82% of the teachers surveyed stated that microscope slides were available. The majority reported adequate quantities and qualities of these materials. More dissatisfaction with quantity and quality of this laboratory item was expressed by teachers in rural locations and at junior high levels (see Table 15).

Photos. Less than one-third of the biology and life science teachers indicated that photographs were available to them for

instructional purposes. The photos were usually of adequate quality but rarely were in sufficient quantities (see Table 16).

Slides. Slides for projection viewing were available to 56% of the teachers. More than one-third (34.5%) reported these materials unavailable. Quality of available materials was frequently adequate but quantities were definitely unsatisfactory (see Table 17).

Transparencies. Transparencies were available for instructional purposes to three-quarters of the classes. The quality was generally adequate. For urban settings the ratings of quality and available quantity usually exceeded that reported by rural teachers. The quantities were described as unsatisfactory by approximately one-quarter of the survey respondents (see Table 18).

Microscope slides were the most abundant visual materials. Schools' requirements for the other visuals were variable. The greatest demand expressed by the biology and life science teachers was for more and better slides and photographs.

Laboratory Equipment and Supplies

Urban senior high teachers reported quantities and qualities of laboratory equipment and supplies that exceeded those described by the other respondents to the survey. In general, senior and combined junior-senior schools indicated more adequate stocking of their laboratories than did junior high schools. Urban junior high schools usually had the least well-supplied laboratories.

Aquarium. This item was present in nearly 82% of the instruc-

tional areas. Most teachers reported satisfaction with the quality and quantity available. Urban senior high teachers usually indicated excellence in rating this item (see Table 19).

Centrifuge. The centrifuge seemed to occupy little importance as an instructional device at the junior high level. Only laboratories at the senior and combined junior-senior level were supplied with this equipment. At these levels 80% indicated it was available. The quality and quantity were usually rated as adequate (see Table 20).

Chemicals. All senior and combined junior-senior high level teachers reported that chemicals were available in their laboratories. Twenty per cent of junior high teachers did not have chemicals available. Supplies in urban senior schools were rated as excellent; in the remainder of levels, they were rated as adequate (see Table 21).

Dissecting kits and trays. Dissecting kits and trays were available in at least two-thirds of the schools. Rural junior high schools were often equipped with kits but not trays. Urban senior high teachers rated their dissecting equipment as excellent. The remaining teachers rated theirs generally adequate, except that some rural junior and combined junior-senior high teachers expressed dissatisfaction with the availability and quality of dissecting equipment (see Tables 22 and 23).

Fire Extinguishers. Despite the critical requirement for this piece of equipment, at least 11% of the teachers reported not having one immediately available. These were all in junior high schools. Half of the junior high teachers in urban locations and one in a rural

location said an extinguisher was not available. Those available were rated as adequate (see Table 24).

First aid kit. First aid kits were available about 70% of the time. The quantity and quality were usually rated excellent at the urban senior high level. Teachers in rural locations rated the quantity adequate at the senior high level, but frequently inadequate for the needs in the junior and combined junior-senior highs (see Table 25).

Gas burner. All senior and combined junior-senior high laboratories were supplied with gas burners. Most junior high level teachers reported having this equipment, however rural teachers expressed more satisfaction than urban junior high teachers with the quantity and quality available for their classroom usage (see Table 26).

Glassware. Nearly all respondents (91%) indicated that they had supplies of glassware. Urban senior high teachers rated quantity and quality of this item as excellent. Teachers in rural locations considered supplies to be adequate and of acceptable quality. Some dissatisfaction with quantities was expressed by urban junior high teachers (see Table 27).

Heating oven. Heating ovens were reported available by 22% of the teachers. Half of the senior and combined junior-senior high schools but only one rural junior high were equipped with this item. Satisfaction was usually absent or not indicated (see Table 28).

Incubator. Approximately 62% of survey respondents indicated that their classes had access to an incubator. Urban junior high teachers reported availability in only one-third of the cases. A majority of the teachers at the other locations and levels rated quantity and quality of

this item as adequate (see Table 29).

Microscopes. Nearly all teachers in this study (93%) reported the availability of monocular microscopes for classroom studies. Less than two-thirds said dissecting microscopes were available. Urban senior high teachers rated their supply of both as adequate to excellent in quantity and quality. Quantities were viewed as unsatisfactory at many junior high and combined junior-senior high schools. The quality of the monocular microscopes was frequently assessed as unsatisfactory at these same locations and in rural senior high schools (see Tables 30 and 31).

Models. Models were available to all urban senior high schools and to the majority of urban junior highs. More than half of the rural teachers had no models available for instructional purposes. Most urban senior highs rated their supplies as adequate in quantity and quality. Teachers at the remaining levels and locations generally described the availability and the quality of this equipment as less than satisfactory (see Table 32).

Plastic mounts. Less than one-quarter (24%) of the teachers stated that plastic mounts were available as instructional aids. The quantity and quality of this item was rated adequate by less than 20% of the survey respondents (see Table 33).

Refrigerators. Approximately half (51%) of the teachers reported this equipment available. Senior and combined junior-senior high schools were most likely to have this item and generally rated it as adequate. Urban junior high labs or science classrooms seldom were

stocked with refrigerators. Junior high teachers usually expressed dissatisfaction with the available quantity and quality of this equipment (see Table 34).

Sinks. Ninety-five per cent of the teachers reported that sinks were available in the lab/classrooms. These were usually of adequate quality, but there was not always a sufficient number, especially in the urban junior high setting (see Table 35).

Slide mounting equipment. This type of equipment was available to about twenty-four per cent of the teachers, usually at the junior high level. Ratings of quantity and quality were usually omitted. No one rated their equipment as excellent (see Table 36).

Specimens. Preserved animal specimens were available to all senior high level teachers. Live animal and plant specimens - both live and preserved - were usually available to this same level. The urban teachers rated their supplies slightly better than did the rural senior teachers. The combined junior-senior lab/classrooms usually were stocked with live plant specimens, and with live and preserved animal specimens. Preserved plants were available in less than half of the cases. Quality was usually rated adequate but a desire for greater quantities was frequently expressed. Junior high teachers usually were supplied with preserved animal and live plant specimens; the rural locations reported greater availability. City teachers at this level especially expressed dissatisfaction with quantities of live plants; rural junior high teachers desired more preserved animals. Both locations were poorly stocked with live animal and preserved plant specimens (see Tables 37, 38, 39 and 40).

Terrarium. About half of the teachers at each level and location indicated that a terrarium was available. The quantity and quality were considered adequate in the majority of instances (see Table 41).

Water bath. This item of laboratory equipment was available in 20% of the schools. Urban senior high teachers reported the most favorable position regarding this item. Assessments of quantity and quality were frequently not provided. Demand for this equipment seems relatively low (see Table 42).

Most teachers reported access to sinks, glassware, chemicals, fire extinguishers, monocular microscopes, gas burners and dissecting kits, as well as aquariums and preserved animal specimens. Plant and live animal specimens were less plentiful. Dissecting microscopes and trays, incubators and first aid kits were available to about two-thirds of the lab/classrooms. Slightly more than half had models, terrariums and refrigerators. Approximately one-third of the schools were supplied with centrifuges, heating ovens, water baths, slide mounting equipment and plastic mounts for instructional purposes. Quantities of supplies were frequently considered to be insufficient, although quality was considered adequate.

Laboratory/Classroom Facilities

Biology and life science classes at the senior and combined junior-senior high levels were located in laboratories or lab/classroom combinations. Classes at the junior high level occasionally were scheduled in ordinary classrooms lacking standard laboratory facilities. This occurred more frequently in urban than in rural junior high schools

(see Table 43). Urban senior high teachers rated their available laboratory space as adequate. Although space was available to rural senior and junior-senior high schools, the quality was frequently less than satisfactory. Lab space was available in fewer than one-half of urban junior high schools. The quality of the space at the junior high level in both urban and rural locations was often considered inadequate (see Table 44).

Urban senior high teachers recorded the largest availability of work stations in laboratories, averaging 12.3. The average number of students assigned to each work station at this level was three. Rural senior and combined junior-senior high schools reported averages of 10.3 and 10.2 for available work stations. The students assigned in each case averaged 3.7 and 3.3 respectively. Junior high science facilities generally contained about half as many work stations as the higher levels. Junior high schools in urban locations reported an average of 5.1 work stations, ranging from zero to fifteen. In rural settings at this level, 6.3 work stations were available on the average, with a range of one to twenty. The number of students per work station was about five at the junior high level (see Tables 45 and 46).

Teachers at the senior high schools, especially urban, described work stations that were more adequate and plentiful than those generally available to junior high levels. Nearly one-quarter of the teachers surveyed rated the quality of available work stations as unsatisfactory. The largest proportion of these were in urban junior high schools (see Table 47).

Work stations were rarely equipped with air outlets, reported in

16% of the cases. Satisfaction with this condition was very low (see Table 48). Eighty-five to 87% of the laboratory facilities contained work station gas and water outlets. The quality of these was frequently unsatisfactory at the junior level and occasionally so at the combined junior-senior level (see Tables 49 and 50). Work station sinks were available and rated similarly to the gas and water outlets (see Table 51).

Demonstration desks were not available to 20% of the biology and life science classes, usually at the junior high level. The quality of available desks was adequate to excellent in the majority of other schools (see Table 52).

Chalkboards were available in all senior high classes and in most others. The quality was satisfactory to excellent at the upper levels. Several rural junior high teachers expressed dissatisfaction with the chalkboard equipment available in the labs or classrooms (see Table 53).

The laboratories and/or classrooms were described as adequately lighted, usually with outside windows. There was some dissatisfaction expressed at all levels except urban senior high with the quality of windows available (see Tables 54 and 55). Ventilation and room temperature control were satisfactory in two-thirds of the classrooms (see Tables 56 and 57).

Most schools contained science storage facilities but the quality was frequently unsatisfactory in junior high level rural locations (see Table 58). Adequate facilities for housing live animals were rare in all locations. They were available in one-third of the cases but the quality was often unsatisfactory (see Table 59).

Annual operating budgets for laboratories at the senior high level averaged twice as large as those for the junior high schools. Urban senior high laboratories fared the best with annual budgets ranging from $300.00 to $1,000.00. The mean annual budget for this level was $625.00. Rural senior high budgets averaged $525.00 with a range of $200.00 to $1,000.00. Budgets averaged approximately $440.00 at the combined junior-senior level; the range was from $50.00 to $1,000.00. Urban junior high teachers reported spending about $300.00 annually in lab operation with a range similar to the rural combined schools. Rural junior high budgets were about $190.00, ranging from zero to $600.00 (see Table 60).

Urban senior high laboratory facilities and budgets were generally superior to those for other locations and levels. Junior high school teachers frequently reported unsatisfactory lab/classroom conditions.

Field Trips

Rural teachers at the combined junior-senior high school level and at the junior high school level reported undertaking an average of about two field trips annually. Urban junior high school teachers and senior high school teachers in both locations averaged three or more field trips per year. Several teachers at the junior and combined junior-senior high levels indicated that field trips were not included in their biology or life science instruction (see Table 61). Seventy-eight per cent of all teachers stated a preference for conducting additional field trips. Five per cent were undecided and about 13% were satisfied with the present number available (see Table 62).

Senior high school teachers reported the highest mean budget allotments for field trips - from $125.00 to more than $1,000.00. Urban junior high teachers had intermediate sized budgets with an annual mean of approximately $77.00. Rural teachers at the combined junior-senior high and junior high levels indicated mean annual budgets of $45.00 and $30.00 respectively. The field trips requisitions were reported available in a variety of forms from open-ended amounts to mileage quotas (see Table 63).

The destinations and purposes of school field trips were quite variable. The main categories were observation of natural environments, specimen collection, and observation of man-made establishments. Nearly two-thirds of the field trips described belong to the first category. Outdoor education and pollution studies were frequently mentioned. In the first category, the activities mentioned most frequently were examining of environment, ecology, ponds, coulees, school yards and rivers. Collection and preservation of specimens, especially insect and plant, was a frequent field trip goal. The man-made establishments that were visited were zoos, game farms, veterinary clinics, planetariums, and water and sewage treatment plants. The outdoor education activities were usually camping and orienteering (see Table 64).

Outdoor Education

Outdoor education programs were available in one-third of the schools. None of these were urban senior highs. Urban junior high teachers reported the most development in this area. More than half of the city junior highs had programs relating to outdoor education. More

than 75% of teachers who had no program indicated that they would like to have or were in the process of developing outdoor education programs in their schools (see Table 65).

Workshops

All senior and combined junior-senior high teachers and most junior high teachers indicated a desire to participate in workshops in the areas of biology and/or life science. Nearly 84% of the surveyed teachers indicated this preference. About one-fourth of the rural junior high teachers were not interested in attending workshops (see Table 66).

Topics suggested for workshop study in descending frequency were in the major categories of curriculum, ecology and environment, materials and techniques, field trip planning, outdoor education, laboratory techniques, and specimen identification. Slight interest was expressed in geology, astronomy and agriculture as study topics. The curriculum topics were primarily in development and articulation. The ecology and environment areas included appreciation of local organisms and ecosystems, conservation, and pollution. Materials and techniques suggested for study were audio-visuals, references, science projects, and motivational techniques. Where specified, the outdoor education needs were in camping and survival methods. Planning and financing field trips, as well as suggestions for activities and exercises, were seen as useful topics for study. Interest was expressed in learning more about laboratory techniques, including dissection, care of live animals, and lab-oriented teaching. Specimen identification was primarily

in the field: flowering plants, insects and wildlife. Data on suggested workshop topics are in Table 67.

Regional Biology/Life Science Organization

Seventy-eight per cent of the survey respondents were in favor of establishing a regional biology/life science organization. Opinions were divided about having separate junior high and senior high organizations rather than one joint group. The teachers in combined junior-senior settings preferred a joint organization. The majority indicated an intent to be an active member if such an organization were established. About 20% more were undecided regarding their level of involvement (see Table 68).

Field Experience Assistance

The majority (58%) of teachers indicated a willingness to work with University of Lethbridge field experience students from the Faculty of Education. Teachers from lower levels were more interested -- urban junior high the most, with rural junior and combined junior-senior high intermediate. Half of the senior high teachers were undecided or did not wish to provide this service. Junior and combined junior-senior high teachers were about equally interested in assisting students at all practicum levels, I through IV. Senior high teachers showed some preference for student placements at higher levels: Practicum III - Student Teaching and Practicum IV - Internship (see Table 69). [The coded identity of the interested teachers is displayed in Table 70 of Appendix A.]

Teacher Training and Experience

The most frequent teaching experience category indicated by the biology and life science teachers in this survey was two years. Approximately 15% described this background. One, four, five and ten years of teaching experience were claimed by about 35%, with about 9% for each year. Two-thirds of the survey respondents reported 10 years or fewer of teaching experience. Forty-four per cent had 5 or less (see Table 71). These results were congruent with the ages of the teachers reported earlier. About 45% were 30 years of age or younger.

The majority (52%) of respondents reported four years of teacher education. Twenty-nine per cent indicated they had five years. Only about 5% had less than the four-year certification requirement. Nine per cent had six or more years of training and 4% did not provide any information on this variable. Rural senior high teachers generally reported the greatest number of years of teacher education in their background (see Table 72). Senior high teachers averaged more university degrees each than did teachers at the other levels. Most (75%) of the urban senior high teachers and about half of the rural senior high teachers had two degrees. Most teachers at other levels had obtained one degree. Forty-five per cent of teachers had been awarded B.Ed. degrees; 40% had B.Sc. degrees. Ten per cent reported B.A. degrees and another 10% had obtained post-graduate degrees, usually Masters of Education. Twenty-five per cent of all teachers reported holding two degrees; one teacher reported three (the third a doctorate). Only teachers in some rural junior and combined junior-senior high settings

reported no degree attainment and they represented merely 11% of the respondents surveyed (see Table 73).

Nearly one-third of the biology and life science teachers in this survey reported that The University of Lethbridge was one institution where they had received their education. Another 55% had attended The University of Alberta or The University of Calgary for a total of 87% educated in Alberta universities. Several teachers had attended more than one institution. Twenty per cent reported attending in the United States, 5% in Canadian universities out of the province, and 5% in locations other than Canada or the United States (see Table 74).

The most frequently reported teacher education majors were biology, physical sciences, and physical education. These represented 60%, 22%, and 15% of teachers respectively. Several teachers reported more than one teaching major in their training. Social studies, mathematics and English majors were reported by 11%, 7%, and 4% of teachers. Other majors were stated by 16% of survey respondents (see Table 75).

Study in beginning methodology for the teaching of biology was reported by 56% of the teachers. About 30% had advanced training in a similar area of study. Most of the rural junior and combined junior-senior high teachers had studied beginning methodology; most of the senior high teachers had studied advanced methodology. Approximately 60% of the surveyed teachers voiced an interest in further study in biology and/or life science teaching methodology. Thirty-five per cent wished to pursue graduate studies; another 10% were uncertain about undertaking post-graduate pursuits (see Table 76).

Twenty per cent of all teachers who responded to the survey reported having no biology courses in their post-secondary academic background. Nearly 30% reported having no zoology courses. Botany and chemistry courses were absent from the background of 44% of the biology and life science teachers in this survey. A minority of respondents recorded study in other related areas (see Table 77).

Senior high teachers described the best academic backgrounds, defined as number of semesters of university or college training in biology and related areas. Rural senior high teachers averaged approximately 6 courses in biology and 4 in each of the areas of botany and zoology. They usually had a course in chemistry and one in another related area. The average overall number of semesters in biology and related areas was approximately 16. Biology courses most frequently named were Genetics, Ecology, and Introductory Biology. In botany the most likely courses to be in the teacher's background were Plant Ecology, Field Botany, and Introductory Botany. The zoology courses most frequently cited were Comparative Vertebrate Anatomy, Introductory Zoology, Embryology, and Invertebrates. The chemistry course was usually organic and the related area course was conservation (see Table 78).

For urban senior high teachers the average of university semester courses was slightly more than 14, with courses in biology, botany and zoology averaging 5½, 2, and 4 respectively. They had one or more courses in chemistry and a course in another related area. Biology courses usually were Introductory Biology, Ecology, and Genetics.

Botany courses were in the areas of plant anatomy, ecology and physiology. Introductory Zoology, Comparative Vertebrate Anatomy, and Invertebrates were the most frequently cited courses in the field of zoology. Organic Chemistry was named, as were Biological Curriculum and courses in oceanography, for related courses in the backgrounds (see Table 79).

The next best academic preparation was reported by teachers in combined junior-senior high settings. Their overall average was about 13 semester courses with 4, 2, and 4 in biology, botany, and zoology respectively. Chemistry courses accounted for another two or more courses; occasional courses in other related areas were recorded. Courses in biology most frequently reported were Introductory Biology, Ecology, and Genetics. Introductory courses and Anatomy of Plants were the common choices in botany. In zoology the courses most often cited were Introductory Zoology, Vertebrates, and Comparative Vertebrate Anatomy. Organic Chemistry was favored and a variety of related courses like Human Kinesiology were mentioned (see Table 80).

In junior high settings the urban teachers were usually better prepared academically than were rural teachers. Urban junior high teachers averaged about 10 semesters of training in biology and related areas. Courses in biology, botany and zoology accounted for 3, 1½, and 4 of these on the average. Mean courses in chemistry were 1½ with some other related areas represented by a few teachers. Junior high teachers generally reported taking introductory courses in biology, botany and zoology. They often cited Genetics, Animal Physiology, Invertebrates, and Comparative Vertebrate Anatomy. Adjunct courses usually were in

organic and biochemistry. Other related courses included History and Philosophy of Science, and Anthropology (see Table 81).

Rural junior high teachers usually had 6 or 7 courses in the necessary academic background. They averaged two in biology and zoology and one in botany and chemistry, with occasional other related courses reported. Introductory courses in biology, botany, and zoology were frequently reported by this group of teachers. Other subject matter courses chosen were Genetics, Animal Physiology, and Organic Chemistry (see Table 82).

DISCUSSION

In this study, it was demonstrated that rural high schools generally are less adequately equipped, are more limited in variety of courses and options, and enroll smaller classes than their urban counterparts. Despite differences in definition of rural, these findings are comparable to those reported in U.S. surveys (Kuvlesky, 1977). The distinction between urban and rural locations was determined by the status of the community in which the schools were located. Only schools located in centres designated as cities under Alberta's system were classified as urban. Some of the rural schools in this study would have been designated urban under the U.S. classificatory system as used in their 1960 and 1970 censuses (Tamblyn, 1977).

The economic benefits enjoyed by larger districts partially explains the advantages accrued by the urban high schools. The urban-rural distinctions are much less apparent at the junior high school level. In several instances the urban junior high teachers reported the least favorable classroom conditions in terms of physical facilities and equipment.

Lack of sufficient funds and inadequate facilities for science instruction appears to be a prevalent and chronic educational problem (Weiss, 1978). Improvement of textbooks and reference materials was a concern common to all respondents in this survey. Less than a third of the texts in usage were rated as adequate to excellent. Many texts were reported as used to supplement the curriculum recommendations. Teachers at all levels and locations indicated that the variety, quantity, and

depth of available reference materials were frequently inadequate for instructional purposes. Textbooks or published programs were reported to play a central role in science instruction in the U.S. national survey (Weiss, 1978). There, over one-third of the teachers reported using multiple texts. The use of the BSCS series of texts was in similar proportion to that reported in this study.

Although the differences between Southern Alberta urban and rural locations in facilities and equipment are lessening, attention still needs to be given to providing adequate instructional environments for biology/life science classes. Regardless of class sizes or other economic considerations, more than minimal facilities should increasingly be made available to the rural locations and to the urban junior high schools until the urban-rural distinction becomes an artificial construct. In the interim, a part of the preservice and in-service experiences for rural and junior high teachers could be aimed at finding creative solutions to equipment and facility shortages.

Preservice and in-service experiences for rural and urban teachers should include preparation for the unique characteristics of those settings (Drier, 1977; Rittenmeyer & Heinen, 1976). Rural teachers can expect generalized teaching assignments with a greater diversity of subject matter responsibilities than teachers in larger urban settings. There is less opportunity to explore specialized option offerings in rural settings. In addition to facility and teaching assignment limitations, rural teachers may face sub-cultural values which can lead to conflicts only overcome by familiarizing themselves with the local

milieu (Dillman & Everett, 1978).

Similar subcultural attitude and value conflicts can occur in the high population density areas like the inner cities where heterogeneous groups merge in one system. Pre- and in-service experiences should allow the teachers to be cognizant of the potential conflicts in both settings and provide direction for the seeking of solutions. The teachers can become aware of the needs for subject versatility and for flexibility in dealing with local attitudes.

Weiss (1978) reported that many secondary science teachers in the U.S. indicated that they were teaching one or more courses in which they felt inadequately qualified. These courses were usually sciences other than their major field. The trend at the senior high level appears to be specialization or assignments in related areas. The major detriment in a related assignment approach is the considerable level of expertise required for senior high school instruction. In-service offerings hopefully could decrease the feeling of limited adequacy by providing information directly relevant to teachers' subject assignments. Preservice preparation could partly anticipate the trend and program options could be chosen accordingly. In this study, many teachers reported more than one teaching major in their preparation, probably anticipating the likelihood of related placement.

Predicting teaching assignments at the rural junior high level is more difficult. The assignments run the gamut from subject specialization to offering the complete curriculum. The latter is probably the most frequent. Preservice options and in-service experiences could

provide some assistance for a teacher with such a placement.

In this study, a desire to participate in workshops to study areas in biology and/or life science was expressed by 84% of the teachers. Suggested topics were in the categories of curriculum, ecology and environment, materials and techniques, field trip planning, outdoor education, laboratory techniques, and specimen identification. Most biology and life science teachers indicated a preference for including more field trips in their instructional plans. Most teachers expressed interest in more development of outdoor education. These priorities agree with the necessary competencies identified by high school biology teachers in a Kansas study (James & Stallings, 1979). Similar in-service needs were outlined in the U.S. national survey. Nearly half of the science teachers in that survey had already attended a nationally sponsored institute or workshop. Teachers still desired assistance in obtaining additional information about teaching methods, instructional materials, the discovery/inquiry approach, and manipulative materials (Weiss, 1978). In Southern Alberta, several abbreviated or a few large multi-purpose workshops would satisfy the diverse topic requirements as identified by the survey respondents.

More than three-quarters of the surveyed teachers favored the establishment of a regional biology-life science organization. Most stated an intent to become an active member. Whether the organization should be joint or separate for junior and senior high levels was a divided issue. Teachers in combined junior-senior high settings preferred a joint organization. This interest appears higher than that

described in the recent U.S. survey, where less than half of the respondents reported actually participating actively in their professional organization over one annual period.

In this survey, only 5% of the teachers had attained less than the four-year requirement for certification. Two-thirds of the respondents reported 10 years or fewer of teaching experience; 44% reported 5 or less. Many senior high level teachers had been awarded two or more degrees. These data do not predict a rapid biology/life science teacher turn over for this region, as compared with the Kansas study (James & Stallings, 1979). With job placements relatively stable and of fairly long duration, in-service and post-degree experiences may increase in importance. As predicted and dictated by curriculum demands, senior high school teachers described better academic backgrounds, defined as number of post-secondary semester courses in biology and related areas. Although biology teaching majors were the most frequently reported, 20% of the surveyed teachers reported no post-secondary training in biology. More than half of the teachers had studied methodology in teaching biology and/or life science. A majority stated a desire to pursue further study in this area. About 33% desired graduate study.

Enrollments in urban biology and life science classes were larger than in rural settings. The enrollments in the high school biology classes gradually decreased as the higher level courses were reached. The decline appeared to be greater in rural areas. These findings are in essential agreement with those for the entire province

(Kass, 1979). Herron (1977) demonstrated the gradually increasing favor that biology has found with the U.S. public high school students. There has been a steady increase in enrollment in that subject. According to Kass (1979), the science enrollment decline during high school in Alberta is noteworthy, although much less pronounced than in the U.S. There, about 50% of students do not take science after grade ten (Helgeson et al., 1977). Students who do not aspire to scientific careers still need a basic scientific knowledge to adapt to the increasing technology in society (Gardner, 1979). This need and the declining interest in science (manifested in decreased enrollments) may yield a restructuring of courses toward a goal of more generalized scientific literacy.

Studies on student attitudes toward science yield some surprising results. Students who elect more than the minimum required science courses do not necessarily have more positive attitudes toward science (De Angelis, 1978). Achievement appears to be a factor in producing positive attitudes toward science. Success in the science courses probably encourages further pursuit of the disciplines. Class sizes appear to have little effect on attitudes toward science except where smaller classes allow better achievement (Ward, 1975). In this study, smaller classes occur in the rural areas and the enrollment decline is greater there.

Students who feel closer themselves to their stereotyped images of scientists appear to enroll more frequently in science. Changing the images of scientists from cool and purely rational persons

and emphasizing the creative and independent aspects of scientific inquiry should encourage more student interest in these disciplines (Brush, 1979). This type of emphasis needs to occur early in students' exposure to science in order to encourage greater interest and enrollments, especially by females and minority groups (Remick & Miller, 1978). Another solution for increasing participation in science courses was presented by Mathis (1977). He proposed applying marketing techniques to advertise the importance of scientific knowledge and to promote the image of science as a subject for all persons with various abilities and personal characteristics.

The trend may be toward earlier terminal courses whose curriculum should be appropriately altered to fulfill the needs of citizens for life science information. The needs of rural students in this area should be closely examined, since they may differ from those of urban students. Positive attitudes toward biology and life science should be effectively incorporated in elementary and secondary education by emphasizing creativity and inquiry, structuring successful and stimulating experiences, and promoting the useful and pragmatic value of scientific knowledge.

REFERENCES

Brush, L. R. Avoidance of science and stereotypes of scientists. *Journal of Research in Science Teaching*, 1979, *16*, 237-241.

De Angelis, J., Jr. *Influence of science instruction on the attitude of students electing science courses.* Beaver College, 1978. (ERIC Document Reproduction Service No. ED 153 848)

Dillman, C. M., & Everett, B. E. *Education in rural America: The culture of the school vs. the culture of the family.* Palo Alto, California: The American Institutes for Research, 1978. (ERIC Document Reproduction Service No. ED 160 259)

Dreier, W. H. *Teachers for rural America - are they recognized and prepared?* Madison, Wisconsin: Rural Sociological Society, 1977. (ERIC Document Reproduction Service No. ED 144 732)

Gardner, M. 10 trends in science education. *The Science Teacher*, 1979, *46*, 30-32.

Helgeson, S. L., Suydam, M. N., Blosser, P. E., Osborne, A., Howe, R. W., Wiley, K. B., & Race, J. The status of pre-college science, mathematics, and social science education: 1955-1975. In L. Ingison, *The status of pre-college science, mathematics, and social studies educational practices in U.S. schools: An overview and summaries of three studies.* Washington, D.C.: National Science Foundation, 1978. (ERIC Document Reproduction Service No. ED 166 034)

Herron, J. D. Declining enrollments: Here are the facts. Where are the answers? *The Science Teacher*, 1977, *44*, 26-29.

James, R. K., & Stallings, M. Laboratory Teaching competencies for secondary biology teachers. *School Science and Mathematics*, 1979, *79*, 207-215.

Kass, H. Science education for the 1980's: Reassessment and response to social change. Paper presented to the Conference of Alberta Science Educators, Red Deer, Alberta, June 1, 1979.

Kuvlesky, W. P. *Rural youth in the USA: Profile of an ignored minority.* Texas A and M University, 1977. (ERIC Document Reproduction Service No. ED 151 111)

Mathis, P. M. *The marketing of science as a school subject.* Rardin, Kentucky: Science Educator's Retreat, 1977. (ERIC Document Reproduction Service No. ED 151 178)

Remick, H., & Miller, K. Participation rates in high school mathematics and science courses. *The Physics Teacher*, 1978, *16*, 280-282.

Rittenmeyer, D. C., & Heinen, J. R. K. *The preparation of urban educators: A survey of urban school systems.* Norfolk, Va.: Old Dominion University Research Foundation, 1976. (ERIC Document Reproduction Service No. ED 146 283)

Tamblyn, L. R. *Rural education and Montana.* Helena, Montana: Montana Education Association, 1977. (ERIC Document Reproduction Service No. ED 147 075)

Ward, W. H. *A test of the association of class size to students' attitudes toward science.* Minneapolis, Minnesota: Minneapolis College of Education, 1975. (ERIC Document Reproduction Service No. ED 148 633)

Weiss, I. R. 1977 national survey of science, mathematics and social studies education highlights report. In L. Ingison, *The status of pre-college science, mathematics, and social studies educational practices in U.S. schools: An overview and summaries of three studies*. Washington, D.C.: National Science Foundation, 1978. (ERIC Document Reproduction Service No. ED 166 034)

APPENDIX A

TABLE 1

TEACHING LEVELS AND LOCATIONS FOR SURVEY RESPONDENTS

Locations	Junior High Schools	Combined Junior-Senior High Schools	Senior High Schools	Total
Urban	12 12.8%	-	4 7.3%	16 29.1%
Rural	19 34.5%	13 23.6%	6 10.9%	38 69.1%
Independent	1 1.8%	-	-	1 1.8%
Total	32 58.2%	13 23.6%	10 18.2%	55 100.0%

TABLE 2

AGE AND SEX OF RESPONDENTS

Age	Female	Male	Not Indicated	Total	%
21 - 25	3	5	-	8	14.5
26 - 30	1	17	-	18	32.7
31 - 35	1	8	-	9	16.4
36 - 40	-	2	-	2	3.6
41 - 45	1	5	-	6	10.9
46 - 50	-	4	-	4	7.3
51 - 55	-	2	-	2	3.6
56 - 60	-	1	-	1	1.8
Not indicated	1	2	2	5	9.1
Total	7	46	2	55	100.0
%	12.7	83.6			

TABLE 3

TEACHING LEVEL AND NUMBER OF SUBJECTS TAUGHT

OTHER THAN BIOLOGY AND/OR LIFE SCIENCE

		0	1	2	3	4	5	6	7	9+	N	Mean Number of Other Subjects
Junior	Urban	2	3	3	2	1	1	-	-	-	12	2.0
	Rural	-	3	3	-	1	2	3	3	4	19	5.2
	Independent	-	-	-	-	-	1	-	-	-	1	5.0
Senior	Urban	4	-	-	-	-	-	-	-	-	4	0.0
	Rural	1	2	1	1	1	-	-	-	-	6	1.8
Combined Junior and Senior	Rural	1	1	1	4	4	1	1	-	-	13	3.2
Total		8	9	8	7	7	5	4	3	4	55	3.3

TABLE 4

COURSES AND ENROLLMENTS IN OTHER SUBJECT AREAS - SENIOR LEVEL

IN RURAL LOCATIONS (N = 6)

Courses (Grades)	Number of Teachers	Number of Courses		Mean Enrollment	Mean Number of Life Science Related Courses
		Total	Average		
Chemistry (10)	3	3	1	26	4.67
(20)	2	2	1	20	3.00
(30)	1	1	1	15	3.00
English (10)	1	2	2	30	7.00
Literature (11-12)	2	2	1	18	5.00
Math (10)	1	3	3	24	3.00
Psychology (20)	1	1	1	25	5.00

Note. One teacher reported teaching only Biology or related courses.

TABLE 5

COURSES AND ENROLLMENTS IN OTHER SUBJECT AREAS - COMBINED JUNIOR AND SENIOR LEVEL IN RURAL LOCATIONS (N = 13)

Courses (Grades)	Number of Teachers	Number of Courses		Mean Enrollment	Mean Number of Life-Science Related Courses
		Total	Average		
Chemistry (10)	5	6	1.2	25.83	5.00
(20)	5	5	1.0	22.20	5.00
(30)	4	4	1.0	16.50	4.75
Earth Science (8)	5	7	1.4	21.00	4.20
Health (7)	1	1	1.0	15.00	2.00
(7 & 8 girls)	1	1	1.0	30.00	6.00
Library Science (8)	1	1	1.0	23.00	1.00
Math (5-6)	1	1	1.0	12.00	1.00
(7-8)	1	1	1.0	16.00	1.00
Physical Education (7-8)	2	3	1.5	25.33	3.00
(7-9)	1	2	2.0	25.00	2.00
Physical Science (9)	5	5	1.0	24.60	3.60
Physics (10)	2	2	1.0	20.00	4.00
(20)	3	3	1.0	12.67	4.00
Psychology (20)	3	3	1.0	16.33	3.67
Religion (8)	1	2	2.0	28.00	3.00
Science (5-6)	1	2	2.0	12.00	1.00
(Option - 9)	2	2	1.0	16.50	3.50

Note. One teacher reported teaching only Biology, Life Science and related courses.

TABLE 6

COURSES AND ENROLLMENTS IN OTHER SUBJECT AREAS - JUNIOR LEVEL

IN URBAN LOCATIONS (N = 12)

Courses (Grades)	Number of Teachers	Number of Courses		Mean Enrollment	Mean Number of Life Science-Related Courses
		Total	Average		
Arts & Crafts (7 & 8)	1	2	2.00	20	5.0
Earth Science (8)	2	5	2.50	28	3.5
Guidance	1	2	2.00	30	1.0
Health (6)	1	1	1.00	30	2.0
(7)	4	9	2.25	28	4.0
Math (7)	1	2	2.00	32	4.0
(8)	2	5	2.50	28	3.5
Physical Education					
(1-6)	1	5	5.00	24	2.0
(7)	1	3	3.00	28	2.0
(7-9)	1	4	4.00	35	5.0
(Special Ed.)	1	1	1.00	25	5.0
Physics (8)	1	1	1.00	27	4.0
(9)	1	2	2.00	33	5.0
Rocketry (8 & 9)	1	3	3.00	28	2.0
Science (8 mod.)	1	1	1.00	27	2.0
(9)	2	5	2.50	32	3.0
Science Fiction	1	1	1.00	16	4.0
Sociology	1	1	1.00	32	4.0

Note. Two teachers reported teaching only Life Sciences or related courses.

TABLE 7

COURSES AND ENROLLMENTS IN OTHER SUBJECT AREAS - JUNIOR LEVEL

IN INDEPENDENT URBAN LOCATION (N = 1)

Courses (Grades)	Number of Teachers	Number of Courses		Mean Enrollment	Mean Number of Life Science-Related Courses
		Total	Average		
Bible (7)	1	1	1	23	2
Earth Science (8)	1	2	2	25	2
Health (7 & 8)	1	4	4	24	2
Options (7-9)	1	2	2	24	2
Physical Science (9)	1	1	1	23	2

TABLE 8

COURSES AND ENROLLMENTS IN OTHER SUBJECT AREAS - JUNIOR LEVEL
IN RURAL LOCATIONS (N = 19)

Courses (Grades)	Number of Teachers	Number of Courses Total	Number of Courses Average	Mean Enrollment	Mean Number of Life Science-Related Courses
Agriculture (7)	1	1	1	15	2
Art (7)	1	2	2	36	2
Arts & Crafts (7-9)	1	1	1	30	1
Astronomy (7-9)	1	1	1	20	2
Audio Visual (7)	1	1	1	22	3
Crafts - Sewing	1	1	1	20	2
Creative Writing (7-8)	1	1	1	19	1
Earth Science (8)	4	5	1.25	26	1.75
Electricity (7-9)	1	1	1	20	2
French (7-9)	1	1	1	16	1
Geography of Canada (7-9)	2	4	2	28.5	1.5
Grade (7)	1	1	1	1	1
(8)	1	1	1	3	1
(9)	1	1	1	8	1
Guidance (9)	1	1	1	13	2
Health (7-9)	1	2	2	33.5	2
Language Arts (8)	1	1	1	29	1
Language Option	1	1	1	22	1
Math. (4-6)	1	1	1	13	2
(6)	2	2	1	16	1
(3-6)	1	4	4	7	1
(7)	3	3	1	12.67	1.67
(8)	2	2	1	12.5	2
(9)	2	2	1	13	2
(Option - 9)	1	1	1	11	3
(Option 7-9)	1	1	1	26	1
Physical Education (1-3)	1	1	1	14	2
(3-6)	2	4	2	21.5	1.5
(7)	4	5	1.25	28	1.5
(8)	5	6	1.2	28.5	1.2
(9)	2	3	1.5	28	1
(7-9)	3	3	1	21	1.67
(Option)	2	2	1	26	1
Physical Science (9)	9	11	1.22	19.18	1.89
Reading (4)	1	1	1	10	1
(6)	1	1	1	16	1
- English (7)	1	1	1	15	2
- Dev. (7-9)	1	1	1	21	2
Science (3-6)	3	4	1.33	14.5	1.33
(6)	3	3	1	22	1.67
Social (7-8)	2	2	1	25.5	2
Typing (7-9)	4	4	1	17.25	1.75
Other	1	4	4	22	2

TABLE 9

COURSES AND ENROLLMENTS IN BIOLOGY AND LIFE SCIENCES

	Junior			Senior		Combined Junior and Senior	
	City	Rural	Independent	City	Rural	Rural	Total
N	12	19	1	4	6	13	55
Biology (Jr. High Option)							
Total classes	4	4	-	-	-	3	11
Ave. no. of classes	0.33	0.21	-	-	-	0.23	-
Ave. enrollment	32.70	19.30	-	-	-	19.30	24.17
Biology 10							
Total classes	-	-	-	8	16	10	34
Ave. no. of classes	-	-	-	2.00	2.67	0.77	-
Ave. enrollment	-	-	-	27.80	26.20	26.30	26.61
Biology 20							
Total classes	-	-	-	5	14	10	29
Ave. no. of classes	-	-	-	1.25	2.33	0.77	-
Ave. enrollment	-	-	-	24.30	22.70	23.30	23.18
Biology 30							
Total classes	-	-	-	5	11	10	26
Ave. no. of classes	-	-	-	1.25	1.83	0.77	-
Ave. enrollment	-	-	-	28.00	19.60	17.00	20.22
Life Science							
Total classes	32	23	2	-	-	14	71
Ave. no. of classes	2.67	1.21	2.00	-	-	1.08	-
Ave. enrollment	28.80	24.30	23.00	-	-	27.20	26.86

Continued...

TABLE 9 (continued)

Science 11							
Total classes	-	-	-	2	2	5	9
Ave. no. of classes	-	-	-	0.50	0.33	0.38	-
Ave. enrollment	-	-	-	19.50	25.50	20.80	21.56
Options Related to Life Sciences							
Outdoor Education							
Total classes	5	1	-	-	-	3	9
Ave. no. of classes	0.42	0.05	-	-	-	0.23	-
Ave. enrollment	30.00	21.00	-	-	-	21.00	26.00
Science Fair							
Total classes	3	-	-	-	-	-	3
Ave. no. of classes	0.25	-	-	-	-	-	-
Ave. enrollment	17.30	-	-	-	-	-	17.30
Hunter Training							
Total classes	-	2	-	-	-	2	4
Ave. no. of classes	-	0.11	-	-	-	0.17	-
Ave. enrollment	-	26.50	-	-	-	15.00	20.75
Science Option Gr. 7							
Total classes	-	2	-	-	-	-	2
Ave. no. of classes	-	0.11	-	-	-	-	-
Ave. enrollment	-	17.50	-	-	-	-	17.50
Biol. Kingdom							
Total classes	1	-	-	-	-	-	1
Ave. no. of classes	0.08	-	-	-	-	-	-
Ave. enrollment	27.00	-	-	-	-	-	27.00
Ecology	*	-	-	-	-	-	-
Oceanography	*	-	-	-	-	-	-

* Indicated as options taught but numbers and sizes of classes not indicated.

TABLE 10

EVALUATION OF TEXTS USED

	Excellent	Adequate	Unsatisfactory	Total Use[a]
Thurber, W.A. & Kilburn, R.E., *Exploring Life Science*	2	16	20	38
BSCS Green Version, *High School Biology*	7	15(1 ref.)	3	26
BSCS Yellow Version, *Biological Science: An Inquiry Into Life*	4	12(1 lab.man.)	3(1 lab.man.)	21
Otto, J.H. & Towle, A., *Modern Biology*	8	7(1 ref.)	1	18
McElroy, W.D. et al., *Foundations of Biology*	4	9	4	17
Nuffield Foundation, *Introducing Living Things*	3	6(1 ref.)	6	16
Nuffield Foundation, *Life and Living Processes*	2	7(1 ref.)	5	15
Abramoff, P. & Thompson, R.G., *Investigations of Cells and Organisms*	1	12	1	14
Ehrenfeld, D.W., *Biological Conservation*	1	5	8	14
Brandwein, P.F., Burnett, R.W. & Stollberg, R., *Life Its Forms and Changes*	4	7	1	13
Wong, H.K. & Dolmatz, M.S., *Ideas and Investigations in Science-Biology*	4	7	1	12
Carter, J.L., Goodman, H.P., Hunter, D.D. & Schelske, L.J., *Life Science: A Problem Solving Approach*	-	6	-	6
Fitspatrick, F.L. & Hole, J.W., *Modern Life Science*	-	2	1	3
Fitspatrick, F.L., Teter, H.E. & Bain, T.D., *Living Things*	-	2	1	3
Hedges, H.G., Andrews, H.C. & Hunt, T.W., *Science Activities*	-	3	-	3
Mason, J.M. & Peters, R.T., *Life Science - A Modern Course*	-	2	1	3
Weisz, P.B., *Elements of Biology*	-	2(1 ref.)	-	3
Clarke, R.A., Booth, P.R., Grigsby, P.E., Haddow, J.F. & Irvine, J.S., *Biology by Inquiry*	-	1	1	2

Continued..

TABLE 10 (continued)

Curtis, *Biology in Daily Life*	-	1	1	2
Frazier, R.P. & Smith, H.A., *The Biological Sciences*	2	-	-	2
Smallwood, W.L., *Life Science*	1	1	-	2
BSCS Blue Version, *Molecules to Man*	1	-	-	1
Brandwein, P.F., Cooper, E.K., Blackwood, P.E. & Hone, E.B., *Concepts in Science 4-6*	1	-	-	1
Branley, F.M., Pella, M.O. & Urban, J., *The World of Life*	-	1	-	1
Curtis, *Everyday Biology*	-	1	-	1
Devos, A., *The Pollution Reader*	-	-	-	1
Eisman & Tanzer, *Biology and Human Progress*	-	1	-	1
Heimler, C.H. & Lockard, J.D., *Focus on Life Science*	1	-	-	1
Heller, R.L., *Challenges to Science*	1	-	-	1
Kennedy, J.E., *Focus on Life Science*	1	-	-	1
MacCracken, H.D., Decker, D.G., Read, J.G., Yarian, A. & Creswell, W.H., Jr., *Life Science*	-	1	-	1
MacKean, D.G., *Introduction to Biolgoy*	-	1	-	1
N.S.T.A., *Investigating Science with Children - V.1, Living Things*	1	-	-	1
Nuffield Foundation, *Biology*	-	1	-	1
Peters, *Biological Science*	-	1	-	1
Ramsey & Burkley, *Modern Life Science*	-	1	-	1
Tolman et al., *Lab Exercises for Introductory Biology*	-	-	1	1
Villee, C.A., Walker, W.F., Jr. & Smith, F.E., *General Zoology*	1	-	-	1
Human Biology and Progress	-	1	-	1
Life Science a Laboratory Approach	-	1	-	1

[a]If the total is greater than the number of evaluations, then use was indicated but an evaluation was not provided.

TABLE 11

EVALUATION OF AVAILABLE REFERENCE MATERIALS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Quantity	Excellent	-	1	-	1	-	3	5	9.1
	Adequate	5	9	1	1	2	5	23	41.8
	Unsatisfactory	7	9	-	2	4	5	27	49.1
Accuracy	Excellent	1	4	-	2	-	1	8	14.5
	Adequate	8	12	-	2	5	10	37	67.3
	Unsatisfactory	2	3	1	-	1	1	8	14.5
Depth	Excellent	1	4	-	2	-	1	8	14.5
	Adequate	6	11	1	1	4	7	30	54.5
	Unsatisfactory	4	4	-	1	2	4	15	27.3
Variety	Excellent	1	4	-	3	-	1	9	16.4
	Adequate	5	7	-	-	3	6	21	38.2
	Unsatisfactory	5	8	1	1	3	5	23	41.8

TABLE 12

AVAILABILITY AND QUALITY OF MATERIALS - CHARTS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	15	-	4	5	10	43	78.2
	No	-	3	1	-	1	2	7	12.7
	Not Indicated	3	1	-	-	-	1	5	9.1
Quantity	Excellent	2	3	-	1	1	1	8	14.5
	Adequate	2	5	-	2	3	6	18	32.7
	Unsatisfactory	7	8	1	1	-	3	20	36.4
	Not Indicated	1	3	-	-	2	3	9	16.4
Quality	Excellent	1	3	-	2	-	1	7	12.7
	Adequate	4	9	-	1	4	7	25	45.5
	Unsatisfactory	4	3	1	1	-	1	10	18.2
	Not Indicated	3	4	-	-	2	4	13	23.6

TABLE 13

AVAILABILITY AND QUALITY OF MATERIALS - FILMS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	13	1	4	3	12	42	76.4
	No	2	6	-	-	3	1	12	21.8
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	2	-	-	-	-	-	2	3.6
	Adequate	5	5	1	2	2	10	25	45.5
	Unsatisfactory	4	9	-	2	2	2	19	34.5
	Not Indicated	1	5	-	-	2	1	9	16.4
Quality	Excellent	1	1	-	-	-	2	4	7.3
	Adequate	6	10	1	3	2	8	30	54.5
	Unsatisfactory	3	3	-	1	1	-	8	14.5
	Not Indicated	2	5	-	-	3	3	13	23.6

TABLE 14

AVAILABILITY AND QUALITY OF MATERIALS - FILMSTRIPS AND LOOPS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	15	1	4	4	9	42	76.4
	No	2	4	-	-	2	4	12	21.8
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	-	-	-	1	-	2	3	5.5
	Adequate	6	5	1	2	2	5	21	38.2
	Unsatisfactory	3	11	-	1	3	3	21	38.2
	Not Indicated	3	3	-	-	1	3	10	18.2
Quality	Excellent	-	1	-	2	1	-	4	7.3
	Adequate	8	9	1	1	2	8	29	52.7
	Unsatisfactory	1	5	-	1	1	1	9	16.4
	Not Indicated	3	4	-	-	2	4	13	23.6

TABLE 15

AVAILABILITY AND QUALITY OF MATERIALS - MICROSCOPE SLIDES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	16	1	4	5	10	45	81.8
	No	2	3	-	-	-	3	8	14.5
	Not Indicated	1	-	-	-	1	-	2	3.6
Quantity	Excellent	3	1	1	2	-	2	9	16.4
	Adequate	4	9	-	2	4	5	24	43.6
	Unsatisfactory	3	5	-	-	1	3	12	21.8
	Not Indicated	2	4	-	-	1	3	10	18.2
Quality	Excellent	1	1	1	2	1	1	7	12.7
	Adequate	6	10	-	2	3	8	29	52.7
	Unsatisfactory	2	5	-	-	-	-	7	12.7
	Not Indicated	3	3	-	-	2	4	12	21.8

TABLE 16

AVAILABILITY AND QUALITY OF MATERIALS - PHOTOS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	3	8	1	1	2	2	17	30.9
	No	7	10	-	1	3	8	29	52.7
	Not Indicated	2	1	-	2	1	3	9	16.4
Quantity	Excellent	2	-	-	-	1	-	3	5.5
	Adequate	1	5	1	-	1	1	9	16.4
	Unsatisfactory	2	5	-	1	-	3	11	20.0
	Not Indicated	7	9	-	3	4	9	32	58.2
Quality	Excellent	1	-	-	-	1	-	2	3.6
	Adequate	2	7	-	1	1	2	13	23.6
	Unsatisfactory	1	3	1	1	-	2	8	14.5
	Not Indicated	8	9	-	2	4	9	32	58.2

TABLE 17

AVAILABILITY AND QUALITY OF MATERIALS - SLIDES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	9	-	3	4	9	31	56.4
	No	4	8	1	-	2	4	19	34.5
	Not Indicated	2	2	-	1	-	-	5	9.1
Quantity	Excellent	2	1	-	-	1	1	5	9.1
	Adequate	3	3	-	1	1	3	11	20.0
	Unsatisfactory	2	8	1	2	1	5	19	34.5
	Not Indicated	5	7	-	1	3	4	20	36.4
Quality	Excellent	2	4	-	-	1	1	8	14.5
	Adequate	2	5	-	1	2	5	15	27.3
	Unsatisfactory	2	3	1	1	-	1	8	14.5
	Not Indicated	6	7	-	2	3	6	24	43.6

TABLE 18

AVAILABILITY AND QUALITY OF MATERIALS - TRANSPARENCIES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	8	14	-	4	5	10	41	74.5
	No	3	4	1	-	-	3	11	20.0
	Not Indicated	1	1	-	-	1	-	3	5.5
Quantity	Excellent	2	1	-	2	-	3	8	14.5
	Adequate	3	7	-	1	3	6	20	36.4
	Unsatisfactory	4	7	1	1	1	1	15	27.3
	Not Indicated	3	4	-	-	2	3	12	21.8
Quality	Excellent	2	4	-	2	-	2	10	18.2
	Adequate	2	9	-	2	3	7	23	41.8
	Unsatisfactory	2	2	1	-	1	-	6	10.9
	Not Indicated	6	4	-	-	2	4	16	29.1

TABLE 19

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - AQUARIUM

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	16	-	3	6	11	45	81.8
	No	2	3	1	1	-	2	9	16.4
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	1	3	-	2	1	-	7	12.7
	Adequate	7	11	-	1	5	9	33	60.0
	Unsatisfactory	2	3	1	-	-	3	9	16.4
	Not Indicated	2	2	-	1	-	1	6	10.9
Quality	Excellent	1	3	-	2	1	-	7	12.7
	Adequate	7	11	-	1	4	11	34	61.8
	Unsatisfactory	1	3	1	-	1	-	6	10.9
	Not Indicated	3	2	-	1	-	2	8	14.5

TABLE 20

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - CENTRIFUGE

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	-	-	-	4	5	7	18	32.7
	No	10	18	1	-	1	3	33	60.0
	Not Indicated	2	1	-	-	-	1	4	7.3
Quantity	Excellent	-	-	-	1	2	3	6	10.9
	Adequate	-	-	-	2	3	6	11	20.0
	Unsatisfactory	1	3	1	-	-	1	6	10.9
	Not Indicated	11	16	-	1	1	3	32	58.2
Quality	Excellent	-	-	-	1	1	1	3	5.5
	Adequate	-	-	-	2	4	7	13	23.6
	Unsatisfactory	-	3	1	-	-	-	4	7.3
	Not Indicated	12	16	-	1	1	5	35	63.6

TABLE 21

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - CHEMICALS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	8	17	1	4	6	13	49	89.1
	No	3	2	-	-	-	-	5	9.1
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	1	2	-	3	2	1	9	16.4
	Adequate	6	13	1	-	4	10	34	61.8
	Unsatisfactory	2	2	-	-	-	2	6	10.9
	Not Indicated	3	2	-	1	-	-	6	10.9
Quality	Excellent	1	4	-	3	1	2	11	20.0
	Adequate	7	11	1	-	5	9	33	60.0
	Unsatisfactory	-	1	-	-	-	1	2	3.6
	Not Indicated	4	3	-	1	-	1	9	16.4

TABLE 22

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - DISSECTING KITS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	4	15	1	4	6	12	42	76.4
	No	7	4	-	-	-	1	12	21.8
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	1	4	-	3	2	1	11	20.0
	Adequate	4	7	1	-	3	10	25	45.5
	Unsatisfactory	1	3	-	-	-	2	6	10.9
	Not Indicated	6	5	-	1	1	-	13	56.4
Quality	Excellent	1	3	-	2	-	-	6	10.9
	Adequate	4	9	1	1	6	10	31	56.4
	Unsatisfactory	-	3	-	-	-	1	4	7.3
	Not Indicated	7	4	-	1	-	2	14	25.5

TABLE 23

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - DISSECTING TRAYS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	4	10	1	4	6	12	37	67.3
	No	7	8	-	-	-	1	16	29.1
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	4	-	3	1	-	9	16.4
	Adequate	4	5	1	-	4	10	24	43.6
	Unsatisfactory	1	3	-	-	1	3	8	14.5
	Not Indicated	6	7	-	1	-	-	14	25.5
Quality	Excellent	1	3	-	3	1	-	8	14.5
	Adequate	4	7	1	-	5	10	27	49.1
	Unsatisfactory	-	2	-	-	-	1	3	5.5
	Not Indicated	7	7	-	1	-	2	17	30.9

TABLE 24

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - FIRE EXTINGUISHER

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	17	1	4	6	13	47	85.5
	No	5	1	-	-	-	-	6	10.9
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	3	-	3	-	1	8	14.5
	Adequate	5	10	1	-	6	6	30	54.5
	Unsatisfactory	1	3	-	-	-	4	8	14.5
	Not Indicated	5	3	-	1	-	-	9	16.4
Quality	Excellent	1	4	-	2	1	2	10	18.2
	Adequate	5	11	1	1	5	10	33	60.0
	Unsatisfactory	-	1	-	-	-	-	1	1.8
	Not Indicated	6	3	-	1	-	1	11	20.0

TABLE 25

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - FIRST AID KIT

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	4	16	1	3	5	9	38	69.1
	No	7	2	-	1	1	4	15	27.3
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	-	-	3	-	-	4	7.3
	Adequate	4	10	1	-	4	8	27	49.1
	Unsatisfactory	1	5	-	-	1	3	10	18.2
	Not Indicated	6	4	-	1	1	2	14	25.5
Quality	Excellent	1	-	-	2	-	-	3	5.5
	Adequate	3	11	1	1	5	9	30	54.5
	Unsatisfactory	1	3	-	-	-	1	5	9.1
	Not Indicated	7	5	-	1	1	3	17	30.9

TABLE 26

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - GAS BURNER

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	8	17	1	4	6	13	49	89.1
	No	3	1	-	-	-	-	4	7.3
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	5	-	3	2	2	13	23.6
	Adequate	3	9	1	-	4	11	28	50.9
	Unsatisfactory	6	2	-	-	-	-	8	14.5
	Not Indicated	2	3	-	1	-	-	6	10.9
Quality	Excellent	1	3	-	2	1	1	8	14.5
	Adequate	5	12	1	1	5	10	34	61.8
	Unsatisfactory	3	1	-	-	-	1	5	9.1
	Not Indicated	3	3	-	1	-	1	8	14.5

95

96

TABLE 27

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - GLASSWARE

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	10	16	1	4	6	13	50	90.9
	No	1	2	-	-	-	-	3	5.5
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	8	-	3	1	3	16	29.1
	Adequate	6	7	1	-	5	8	27	49.1
	Unsatisfactory	4	1	-	-	-	2	7	12.7
	Not Indicated	1	3	-	1	-	-	5	9.1
Quality	Excellent	2	5	-	3	1	2	13	23.6
	Adequate	7	11	1	-	5	10	34	61.8
	Unsatisfactory	1	-	-	-	-	-	1	1.8
	Not Indicated	2	3	-	1	-	1	7	12.7

TABLE 28

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - HEATING OVEN

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	-	1	-	2	3	6	12	21.8
	No	11	16	1	-	3	5	36	65.5
	Not Indicated	1	2	-	2	-	2	7	12.7
Quantity	Excellent	-	-	-	1	-	2	3	5.5
	Adequate	-	2	-	-	3	5	10	18.2
	Unsatisfactory	3	3	1	-	-	-	7	12.7
	Not Indicated	9	14	-	3	3	6	35	63.6
Quality	Excellent	-	-	-	-	-	1	1	1.8
	Adequate	-	2	-	1	3	4	10	18.2
	Unsatisfactory	-	3	1	-	-	-	4	7.3
	Not Indicated	12	14	-	3	3	8	40	72.7

TABLE 29

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - INCUBATOR

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	4	13	-	3	4	10	34	61.8
	No	7	6	1	1	1	2	18	32.7
	Not Indicated	1	-	-	-	1	1	3	5.5
Quantity	Excellent	2	-	-	1	-	2	5	9.1
	Adequate	2	12	-	2	4	8	28	50.9
	Unsatisfactory	2	4	1	-	-	1	8	14.5
	Not Indicated	6	3	-	1	2	2	14	25.5
Quality	Excellent	1	2	-	1	-	1	5	9.1
	Adequate	2	9	-	1	3	8	23	41.8
	Unsatisfactory	-	5	1	1	1	-	8	14.5
	Not Indicated	9	3	-	1	2	4	19	34.5

TABLE 30

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - DISSECTING MICROSCOPES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	8	8	-	4	5	10	35	63.6
	No	2	9	1	-	1	1	14	25.5
	Not Indicated	2	2	-	-	-	2	6	10.9
Quantity	Excellent	-	1	-	3	-	1	5	9.1
	Adequate	4	2	-	-	2	3	11	20.0
	Unsatisfactory	4	7	1	1	3	6	22	40.0
	Not Indicated	4	9	-	-	1	3	17	30.9
Quality	Excellent	1	2	-	3	2	1	9	16.4
	Adequate	5	5	-	1	3	7	21	38.2
	Unsatisfactory	1	2	1	-	-	2	6	10.9
	Not Indicated	5	10	-	-	1	3	19	34.5

TABLE 31

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - MONOCULAR MICROSCOPES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	18	1	4	6	13	51	92.7
	No	1	-	-	-	-	-	1	1.8
	Not Indicated	2	1	-	-	-	-	3	5.5
Quantity	Excellent	2	2	-	2	1	2	9	16.4
	Adequate	3	7	1	2	3	7	23	41.8
	Unsatisfactory	7	8	-	-	1	4	20	36.4
	Not Indicated	-	2	-	-	1	-	3	5.5
Quality	Excellent	4	3	-	2	1	1	11	20.0
	Adequate	4	10	1	2	2	6	25	45.5
	Unsatisfactory	3	4	-	-	2	5	14	25.5
	Not Indicated	1	2	-	-	1	1	5	9.1

TABLE 32

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - MODELS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	7	1	4	2	5	25	45.5
	No	4	12	-	-	3	8	27	49.1
	Not Indicated	2	-	-	-	1	-	3	5.5
Quantity	Excellent	1	-	-	1	-	-	2	3.6
	Adequate	-	4	-	2	1	3	10	18.2
	Unsatisfactory	6	6	1	1	1	3	18	32.7
	Not Indicated	5	9	-	-	4	7	25	45.5
Quality	Excellent	1	1	-	2	-	-	4	7.3
	Adequate	2	4	-	2	1	2	11	20.0
	Unsatisfactory	3	4	1	-	1	3	12	21.8
	Not Indicated	6	10	-	-	4	8	28	50.9

TABLE 33

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - PLASTIC MOUNTS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	2	3	1	2	1	4	13	23.6
	No	8	15	-	1	5	7	36	65.5
	Not Indicated	2	1	-	1	-	2	6	10.9
Quantity	Excellent	-	-	-	1	-	-	1	1.8
	Adequate	1	2	1	-	1	2	7	12.7
	Unsatisfactory	2	4	-	1	-	5	12	21.8
	Not Indicated	9	13	-	2	5	6	35	63.6
Quality	Excellent	-	1	-	1	-	-	2	3.6
	Adequate	1	1	1	1	1	4	9	16.4
	Unsatisfactory	1	3	-	-	-	2	6	10.9
	Not Indicated	10	14	-	2	5	7	38	69.1

TABLE 34

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - REFRIGERATOR

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	3	8	1	3	4	9	28	50.9
	No	8	10	-	1	2	4	25	45.5
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	2	-	2	-	1	6	10.9
	Adequate	1	5	-	1	4	9	20	36.4
	Unsatisfactory	3	3	1	-	-	-	7	12.7
	Not Indicated	7	9	-	1	2	3	22	40.0
Quality	Excellent	1	2	-	1	-	-	4	7.3
	Adequate	2	5	-	2	4	8	21	38.2
	Unsatisfactory	-	2	1	-	-	-	3	5.5
	Not Indicated	9	10	-	1	2	5	27	49.1

TABLE 35

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - SINKS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	10	18	1	4	6	13	52	94.5
	No	1	-	-	-	-	-	1	1.8
	Not Indicated	1	1	-	-	-	-	2	3.6
Quantity	Excellent	1	3	-	2	3	2	11	20.0
	Adequate	6	10	-	-	2	8	26	47.3
	Unsatisfactory	4	2	1	1	-	3	11	20.0
	Not Indicated	1	4	-	1	1	-	7	12.7
Quality	Excellent	2	2	-	1	2	-	7	12.7
	Adequate	5	11	-	2	3	8	29	52.7
	Unsatisfactory	1	3	1	-	-	3	8	14.5
	Not Indicated	4	3	-	1	1	2	11	20.0

TABLE 36

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - SLIDE MOUNTING EQUIPMENT

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	3	7	1	-	2	-	13	23.6
	No	8	11	-	2	4	10	35	63.6
	Not Indicated	1	1	-	2	-	3	7	12.7
Quantity	Adequate	2	4	1	-	1	-	8	14.5
	Unsatisfactory	2	5	-	1	1	3	12	21.8
	Not Indicated	8	10	-	3	4	10	35	63.6
Quality	Adequate	2	4	1	-	1	1	9	16.4
	Unsatisfactory	1	3	-	1	1	2	8	14.5
	Not Indicated	9	12	-	3	4	10	38	69.1

TABLE 37

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - LIVE ANIMAL SPECIMENS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	3	7	1	3	4	8	26	47.3
	No	8	11	-	1	2	3	25	45.5
	Not Indicated	1	1	-	-	-	2	4	7.3
Quantity	Excellent	-	-	-	1	-	1	2	3.8
	Adequate	2	3	1	1	1	2	10	18.2
	Unsatisfactory	3	6	-	1	3	4	17	30.9
	Not Indicated	7	10	-	1	2	6	26	47.3
Quality	Excellent	-	-	-	1	-	-	1	1.8
	Adequate	1	4	1	2	3	4	15	27.3
	Unsatisfactory	1	3	-	-	-	1	5	9.1
	Not Indicated	10	12	-	1	3	8	34	61.8

TABLE 38

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - PRESERVED ANIMAL SPECIMENS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	7	17	1	4	6	12	47	85.5
	No	4	2	-	-	-	1	7	12.7
	Not Indicated	1	-	-	-	-	-	1	1.8
Quantity	Excellent	1	-	-	2	1	1	5	9.1
	Adequate	5	7	1	1	3	6	23	41.8
	Unsatisfactory	3	10	-	-	1	5	19	34.5
	Not Indicated	3	2	-	1	1	1	8	14.5
Quality	Excellent	1	-	-	2	-	-	3	5.5
	Adequate	5	9	1	-	4	7	26	47.3
	Unsatisfactory	2	6	-	1	-	2	11	20.0
	Not Indicated	4	4	-	1	2	4	15	27.3

TABLE 39

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - LIVE PLANT SPECIMENS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	5	11	1	3	5	7	32	58.2
	No	6	8	-	1	-	4	19	34.5
	Not Indicated	1	-	-	-	1	2	4	7.3
Quantity	Excellent	1	-	-	1	1	1	4	7.3
	Adequate	1	7	1	1	2	2	14	25.5
	Unsatisfactory	4	5	-	1	2	4	16	29.1
	Not Indicated	6	7	-	1	1	6	21	38.2
Quality	Excellent	1	1	-	1	1	-	4	7.3
	Adequate	2	6	1	2	4	4	19	34.5
	Unsatisfactory	2	4	-	-	-	2	8	14.5
	Not Indicated	7	8	-	1	1	7	24	43.6

TABLE 40

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - PRESERVED PLANT SPECIMENS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	4	5	1	3	3	5	21	38.2
	No	7	14	-	1	2	7	31	56.4
	Not Indicated	1	-	-	-	1	1	3	5.5
Quantity	Excellent	1	-	-	1	-	-	2	3.6
	Adequate	2	3	-	2	2	4	13	23.6
	Unsatisfactory	2	4	1	-	1	3	11	20.0
	Not Indicated	7	12	-	1	3	6	29	52.7
Quality	Excellent	1	-	-	1	-	-	2	3.6
	Adequate	3	4	-	2	3	4	16	29.1
	Unsatisfactory	-	3	1	-	-	1	5	9.1
	Not Indicated	8	12	-	1	3	8	32	58.2

TABLE 41

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - TERRARIUM

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	10	-	2	4	6	28	50.9
	No	5	8	1	2	2	6	24	43.6
	Not Indicated	1	1	-	-	-	1	3	5.5
Quantity	Excellent	1	2	-	1	-	-	4	7.3
	Adequate	4	5	-	1	3	3	16	29.1
	Unsatisfactory	2	3	1	1	-	3	10	18.2
	Not Indicated	5	9	-	1	3	7	25	45.5
Quality	Excellent	1	1	-	2	-	-	4	7.3
	Adequate	4	7	-	-	3	4	18	32.7
	Unsatisfactory	1	2	1	1	1	2	8	14.5
	Not Indicated	6	9	-	1	2	7	25	45.5

TABLE 42

AVAILABILITY AND QUALITY OF EQUIPMENT AND SUPPLIES - WATER BATH

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	3	1	-	3	1	3	11	20.0
	No	8	17	1	1	5	8	40	72.7
	Not Indicated	1	1	-	-	-	2	4	7.3
Quantity	Excellent	-	-	-	2	-	-	2	3.6
	Adequate	2	1	-	1	1	4	9	16.4
	Unsatisfactory	2	4	1	-	-	1	8	14.5
	Not Indicated	8	14	-	1	5	8	36	65.5
Quality	Excellent	-	-	-	1	-	-	1	1.8
	Adequate	2	1	-	2	-	3	8	14.5
	Unsatisfactory	1	3	1	-	1	1	7	12.7
	Not Indicated	9	15	-	1	5	9	39	70.9

TABLE 43

ROOM LOCATION OF BIOLOGY AND/OR LIFE SCIENCE CLASSES

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
Laboratory	2	3	-	3	2	2	12	21.8
Classroom	5	3	-	-	-	-	8	14.5
Both	4	12	1	1	4	11	33	60.0
Library	1	-	-	-	-	-	1	1.8
Not indicated	-	1	-	-	-	-	1	1.8
Total	12	19	1	4	6	13	55	100.0

TABLE 44

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - SPACE

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	5	14	1	3	5	12	40	72.7
	No	5	2	-	-	-	-	7	12.7
	Not Indicated	2	3	-	1	1	1	8	14.5
Quality	Excellent	-	7	-	1	1	3	12	21.8
	Adequate	4	5	-	2	2	6	19	34.5
	Unsatisfactory	5	5	1	-	3	4	18	32.7
	Not Indicated	3	2	-	1	-	-	6	10.9

TABLE 45

NUMBER OF WORK STATIONS AVAILABLE

Number	Junior			Senior		Combined Junior and Senior	Total	%
	City	Rural	Independent	City	Rural	Rural		
0	3	-	-	-	-	-	3	5.5
1	-	2	-	-	-	-	2	3.6
2	1	2	-	-	-	-	3	5.5
3	-	-	-	-	-	1	1	1.8
4	2	1	-	-	1	2	6	10.9
5	1	3	-	-	-	-	4	7.3
6	-	6	-	-	2	1	9	16.4
7	-	-	-	1	-	-	1	1.8
8	2	3	-	-	-	3	8	14.5
9	-	-	-	-	-	1	1	1.8
10	1	-	1	-	-	-	2	3.6
12	-	-	-	2	-	-	2	3.6
14	-	1	-	-	-	-	1	1.8
15	1	-	-	-	2	2	5	9.1
16	-	-	-	-	1	1	2	3.6
18	-	-	-	1	-	2	3	5.5
20	-	1	-	-	-	-	1	1.8
Not Indicated	1	-	-	-	-	-	1	1.8
Total	12	19	1	4	6	13	55	100.0
Mean	5.1	6.3	10.0	12.3	10.3	10.2		

TABLE 46

AVERAGE NUMBER OF STUDENTS PER WORK STATION

Average Number of Students	Junior			Senior		Combined Junior and Senior	Total	%
	City	Rural	Independent	City	Rural	Rural		
0	1	1	-	-	-	-	1	1.8
1	-	1	-	-	-	-	1	1.8
2	1	3	1	1	3	5	14	25.5
3	1	3	-	2	-	2	8	14.5
4	2	4	-	1	-	4	11	20.0
5	-	1	-	-	2	1	4	7.3
6	1	3	-	-	1	1	6	10.9
8	2	1	-	-	-	-	3	5.5
10	-	1	-	-	-	-	1	1.8
17	1	-	-	-	-	-	1	1.8
27	-	1	-	-	-	-	1	1.8
Not Indicated	3	1	-	-	-	-	4	7.3
Total	12	19	1	4	6	13	55	100.0
Mean	5.8	5.6	2.0	3.0	3.7	3.3		

TABLE 47

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - WORK STATIONS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	11	1	1	6	10	35	63.6
	No	5	3	-	1	-	1	10	18.2
	Not Indicated	1	5	-	2	-	2	10	18.2
Quality	Excellent	-	3	-	-	2	1	6	10.9
	Adequate	2	5	-	1	2	7	17	30.9
	Unsatisfactory	6	3	1	-	1	2	13	23.6
	Not Indicated	4	8	-	3	1	3	19	34.5

TABLE 48

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - WORK STATION AIR OUTLET

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	2	3	-	2	-	2	9	16.4
	No	8	13	1	2	5	9	38	69.1
	Not Indicated	2	3	-	-	1	2	8	14.5
Quality	Excellent	-	1	-	1	-	-	2	3.6
	Adequate	1	2	-	-	-	-	3	5.5
	Unsatisfactory	3	6	1	1	1	3	15	27.3
	Not Indicated	8	10	-	2	5	10	35	63.6

TABLE 49

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - WORK STATION GAS OUTLET

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	8	15	1	4	6	13	47	85.5
	No	2	2	-	-	-	-	4	7.3
	Not Indicated	2	2	-	-	-	-	4	7.3
Quality	Excellent	-	3	-	3	4	4	14	25.5
	Adequate	4	8	1	-	2	7	22	40.0
	Unsatisfactory	5	4	-	-	-	2	11	20.0
	Not Indicated	3	4	-	1	-	-	8	14.5

TABLE 50

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - WORK STATION WATER OUTLET

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	16	1	4	6	12	48	87.3
	No	1	1	-	-	-	1	3	5.5
	Not Indicated	2	2	-	-	-	-	4	7.3
Quality	Excellent	-	2	-	1	4	1	8	14.5
	Adequate	5	10	1	1	2	8	27	49.1
	Unsatisfactory	4	4	-	1	-	3	12	21.8
	Not Indicated	3	3	-	1	-	1	8	14.5

TABLE 51

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - WORK STATION SINK

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	16	1	4	6	12	48	87.3
	No	1	1	-	-	-	1	3	5.5
	Not Indicated	2	2	-	-	-	-	4	7.3
Quality	Excellent	-	2	-	-	4	3	9	16.4
	Adequate	5	11	-	1	2	5	24	43.6
	Unsatisfactory	4	3	1	1	-	4	13	23.6
	Not Indicated	3	3	-	2	-	1	9	16.4

TABLE 52

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - DEMONSTRATION DESK

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	6	13	1	4	5	11	40	72.7
	No	5	4	-	-	1	1	11	20.0
	Not Indicated	1	2	-	-	-	1	4	7.3
Quality	Excellent	-	4	-	1	3	3	11	20.0
	Adequate	5	7	-	1	1	7	21	38.2
	Unsatisfactory	1	4	1	1	1	2	10	18.2
	Not Indicated	6	4	-	1	1	1	13	23.6

TABLE 53

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - CHALKBOARDS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	11	17	1	4	6	12	51	92.7
	Not Indicated	1	2	-	-	-	1	4	7.3
Quality	Excellent	2	3	-	2	3	4	14	25.5
	Adequate	6	7	1	1	3	8	26	47.3
	Unsatisfactory	3	6	-	-	-	1	10	18.2
	Not Indicated	1	3	-	1	-	-	5	9.1

TABLE 54

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - LIGHTING

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	11	15	1	4	5	12	48	87.3
	No	-	2	-	-	-	-	2	3.6
	Not Indicated	1	2	-	-	1	1	5	9.1
Quality	Excellent	3	4	-	3	2	4	16	29.1
	Adequate	6	12	1	-	4	7	30	54.5
	Unsatisfactory	2	2	-	-	-	2	6	10.9
	Not Indicated	1	1	-	1	-	-	3	5.5

TABLE 55

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - OUTSIDE WINDOWS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	17	1	2	5	11	45	81.8
	No	2	-	-	2	-	-	4	7.3
	Not Indicated	1	2	-	-	1	2	6	10.9
Quality	Excellent	-	3	-	2	2	2	9	16.4
	Adequate	6	11	-	-	2	7	26	47.3
	Unsatisfactory	3	3	1	-	2	3	12	21.8
	Not Indicated	3	2	-	2	-	1	8	14.5

TABLE 56

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - VENTILATION

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	9	10	1	2	5	10	37	67.3
	No	1	7	-	2	-	2	12	21.8
	Not Indicated	2	2	-	-	1	1	6	10.9
Quality	Excellent	-	1	-	2	1	1	5	9.1
	Adequate	6	8	1	-	2	3	20	36.4
	Unsatisfactory	4	5	-	-	3	7	19	34.5
	Not Indicated	2	5	-	2	-	2	11	20.0

TABLE 57

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - ROOM TEMPERATURE CONTROL

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	10	11	1	3	4	8	37	67.3
	No	1	6	-	1	1	3	12	21.8
	Not Indicated	1	2	-	-	1	2	6	10.9
Quality	Excellent	1	2	1	3	1	2	10	18.2
	Adequate	7	6	-	-	4	4	21	38.2
	Unsatisfactory	2	5	-	-	1	4	12	21.8
	Not Indicated	2	6	-	1	-	3	12	21.8

TABLE 58

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - STORAGE FACILITIES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	10	15	1	4	5	12	47	85.5
	No	1	2	-	-	1	-	4	7.3
	Not Indicated	1	2	-	-	-	1	4	7.3
Quality	Excellent	1	2	-	1	2	2	8	14.5
	Adequate	6	10	-	1	2	6	25	45.5
	Unsatisfactory	3	6	1	1	1	5	17	30.9
	Not Indicated	2	1	-	1	1	-	5	9.1

TABLE 59

AVAILABILITY AND QUALITY OF LABORATORY FACILITIES - FACILITIES FOR HOUSING LIVE ANIMALS

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Available	Yes	2	6	-	3	4	4	19	34.5
	No	8	11	1	1	2	7	30	54.5
	Not Indicated	2	2	-	-	-	2	6	10.9
Quality	Excellent	-	-	-	-	1	-	1	1.8
	Adequate	1	1	-	1	1	2	6	10.9
	Unsatisfactory	2	8	1	2	3	6	22	40.0
	Not Indicated	9	10	-	1	1	5	26	47.3

TABLE 60

ANNUAL OPERATING BUDGET FOR LABORATORY

Budget Approximate Dollars	Junior			Senior		Combined Junior and Senior	Total
	City	Rural	Independent	City	Rural	Rural	
0	-	2	-	-	-	-	2
24	-	1	-	-	-	-	1
40	-	1	-	-	-	-	1
50	1	1	-	-	-	1	3
74	1	-	-	-	-	-	1
82	-	-	1	-	-	-	1
100	-	3	-	-	-	1	4
125	-	1	-	-	-	-	1
150	1	-	-	-	-	1	2
170	-	-	-	-	-	1	1
200	3	4	-	-	1	-	8
250	-	1	-	-	-	1	2
300	3	1	-	1	1	1	7
400	-	1	-	-	1	1	3
450	-	-	-	-	1	-	1
500	1	1	-	1	-	1	4
600	-	1	-	-	-	1	2
700	-	-	-	1	-	-	1
750	-	-	-	-	-	1	1
800	-	-	-	-	1	-	1
1000	1	-	-	1	1	2	5
Not Indicated	1	1	-	-	-	1	3
Total	12	19	1	4	6	13	55
Total Dollars	3274.00	3389.00	82.00	2500.00	3150.00	5270.00	17,665.00
Average Dollars	297.64	188.28	82.00	625.00	525.00	439.17	339.71

TABLE 61

NUMBER OF FIELD TRIPS PER SCHOOL YEAR

Number of Field Trips	Junior			Senior		Combined Junior and Senior	Total	%
	City	Rural	Independent	City	Rural	Rural		
0	2	6	1	-	-	5	14	25.5
1	2	3	-	-	1	3	9	16.4
2	1	2	-	3	3	1	10	18.2
3	3	3	-	-	-	-	6	10.9
4	1	3	-	-	-	2	6	10.9
6	1	-	-	-	1	1	3	5.5
7	1	-	-	-	-	-	1	1.8
8	-	-	-	1	-	-	1	1.8
9 or more	1	1	-	-	1	-	3	5.5
Not Indicated	-	1	-	-	-	1	2	3.6
Total	12	19	1	4	6	13	55	100.0

TABLE 62

PREFERENCE FOR ADDITIONAL FIELD TRIPS

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
Yes	10	18	1	3	1	10	43	78.2
No	1	1	-	1	2	2	7	12.7
Questionable	-	-	-	-	3	-	3	5.5
Not Indicated	1	-	-	-	-	1	2	3.6
Total	12	19	1	4	6	13	55	100.0

TABLE 63

ANNUAL BUDGET ALLOTMENT FOR FIELD TRIPS

Budget	Junior			Senior		Combined Junior and Senior	Total	%
	City	Rural	Independent	City	Rural	Rural		
Dollars								
0	4	9	-	1	3	3	20	36.4
50	2	-	-	-	-	1	3	5.5
60	-	1	-	-	-	-	1	1.8
90	1	-	-	-	-	-	1	1.8
100	-	1	-	-	-	1	2	3.6
120	-	-	-	-	-	1	1	1.8
150	-	-	-	-	1	-	1	1.8
200	1	1	-	-	-	-	2	3.6
250	-	-	-	1	-	-	1	1.8
300	1	-	-	-	-	-	1	1.8
1000	-	-	-	-	1	-	1	1.8
Other								
Adequate	-	-	-	-	-	1	1	1.8
Allotted $2900 forthcoming year	-	-	-	1	-	-	1	1.8
Mileage								
100 miles	1	1	-	-	-	1	3	5.5
250 bus miles	-	-	-	-	-	1	1	1.8
One per year	-	2	-	-	1	-	3	5.5
Open (as required)	-	1	1	-	-	-	2	3.6
Not Indicated	2	3	-	1	-	4	10	18.2
Total	12	19	1	4	6	13	55	100.0
Average Dollars (with forthcoming allotment)	$76.67	$30.00		$125.00 ($1050.00)	$230.00	$45.00	$80.00 ($160.57)	

TABLE 64

NATURE OF FIELD TRIPS

	Junior	Senior	Combined Junior and Senior	Total	
Natural Environment					43
Coulee	3	1	1	5	
Field Population-Neighbouring Grasslands	1	-	-	1	
Local Pond	4	1	2	7	
Local Biomes	1	-	-	1	
Local Habitat	1	-	-	1	
Examine Environment-Ecology	4	1 1(O.E.)	3	9	
Fossil hunting-Ecology of Bad Lands	-	1	-	1	
Orchard	1	-	-	1	
River	1	1	-	2	
Slough	1	-	-	1	
Woodlot	-	1	-	1	
Vegetation of School Yard	4	-	-	4	
West Castle Pond	2	1	1	4	
Writing-on-Stone	-	1	-	1	
Cypress Hills	1	-	-	1	
Pothole Creek	1	-	-	1	
Waterton	1	1	-	2	
Collecting					16
Insects	4	1	-	5	
Specimens	2	1(O.E.)	1 1(& preserve)	6	
Soil Samples	-	1	-	1	
Plants	2	1	-	3	
Fresh-water Micro-organisms	1	-	-	1	
Man-Made Establishments					13
Calgary Zoo & Aquarium (1 also planetarium & museum)	2	-	-	2	
Calgary Zoo	-	1	-	1	
Game Farm	-	-	1	1	
Ag. Research Institution	-	-	1	1	
Brewery	-	-	1	1	
Feedlot & Packing Plant	-	1	-	1	
Sugar Factory	-	-	1	1	
Veterinary Clinic	-	1	1	2	
Water Treatment Plant	1	-	-	1	
Sewage Treatment	-	1	1	2	
Outdoor Education (O.E.)	1	-	-	1	3
Measurements, definitions mapping, identifying	-	1	-	1	
Camping Trip - 4 days	1	-	-	1	
Pollution Studies	-	1	-	1	1

TABLE 65

OUTDOOR EDUCATION PROGRAMS RELATED TO

BIOLOGY AND/OR LIFE SCIENCES

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Program in the School	Yes	7	5	-	-	2	5	19	34.5
	No	4	14	1	4	4	8	35	63.6
	Not Indicated	1	-	-	-	-	-	1	1.8
Like to Develop[a]	Yes	4	11	-	2	3	7	27	75.0
	No	-	2	1	-	-	-	3	8.3
	Being Developed	-	-	-	1	-	-	1	2.8
	Uncertain	-	-	-	1	1	-	2	5.6
	Not Indicated	1	1	-	-	-	1	3	8.3

[a]Percentage is based on those not indicating the presence of a program in the school.

TABLE 66

INTEREST IN WORKSHOP PARTICIPATION

Participation	Junior			Senior		Combined Junior and Senior	Total	%
	City	Rural	Independent	City	Rural	Rural		
Yes	10	14	1	4	4	13	46	83.6
No	1	5	-	-	-	-	6	10.9
Depends on Travel	-	-	-	-	1	-	1	1.8
Not indicated	1	-	-	-	1	-	2	3.6
Total	12	19	1	4	6	13	55	100.0

TABLE 67

SUGGESTED WORKSHOP TOPICS

	Junior	Senior	Combined Junior and Senior	Total	
Curriculum					16
Development (multi text-grade 7)	1	-	(1)	2	
Methods & curriculum articulation	1	1	-	2	
Setting up suitable programs & labs(rooms)	1	-	-	1	
CRIB Program	1	-	-	1	
Genetics - evolution	-	-	1	1	
Biology 20 curriculum	-	-	1	1	
Anything	3	1 (practical)	1	5	
Life Science	1	-	1	2	
Biology 30 - homeostatic mechanisms	-	-	1	1	
Ecology and Environment	3	1	1	5	13
Study of local flora & fauna	3	1	-	4	
Biotic communities in S.W. Alberta					
Ecosystems: pond, rivers, mountain, grasslands	-	1	-	1	
Conservation	1	-	-	1	
Appreciation of living organisms	1	-	-	1	
Pollution	-	-	1	1	
Identification					4
Wildlife	-	-	1	1	
Insects, micro-organisms	-	-	1	1	
Flowering plants	-	-	1	1	
Collecting & preserving arthropods	-	-	1	1	
Geology					2
Interpretation geologic structures and strata	-	-	1	1	
Rock identification	-	-	1	1	
Laboratory					5
Lab-oriented science teaching	1	-	-	1	
Care of live animals	2	-	-	2	
New lab ideas	-	1	-	1	
Dissection	1	-	-	1	
Field Trips-planning, exercises, financing	4	-	2	6	6
Outdoor Education	2	-	1	3	6
Survival	-	-	1	1	
Camping	-	-	1	1	
Use of map & compass	-	-	1	1	
Materials and Techniques					7
Equipment, techniques & A-V materials	-	3	-	3	
Alternate reference materials	-	1	-	1	
New materials	-	1	-	1	
Student science project ideas & organ.	-	1	-	1	
Motivation of students	-	1	-	1	
Astronomy	-	-	1	1	1
Agriculture (Colony teacher)	1	-	-	1	1

TABLE 68

REGIONAL BIOLOGY/LIFE SCIENCE ORGANIZATION

		Junior			Senior		Combined Junior and Senior		
		City	Rural	Independent	City	Rural	Rural	Total	%
Establish a Regional	Yes	7	17	1	2	5	11	43	78.2
	No	2	1	-	-	-	-	3	5.5
	Uncertain	-	1	-	1	-	1	3	5.5
	Not Indicated	3	-	-	1	1	1	6	10.9
Separate Junior and Senior High	Yes	6	10	-	2	2	2	22	40.0
	No	3	8	1	1	3	9	25	45.5
	Uncertain	-	1	-	-	1	1	3	5.5
	Not Indicated	3	-	-	1	-	1	5	9.1
Active Member	Yes	7	9	1	2	4	7	30	54.5
	No	1	6	-	1	-	1	9	16.4
	Uncertain	1	3	-	1	2	3	10	18.2
	Not Indicated	3	1	-	-	-	2	6	10.9

TABLE 69

INTEREST IN WORKING WITH FIELD EXPERIENCE STUDENTS

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
Interest								
Yes	8	11	-	2	3	8	32	58.2
Level								
I	6	4	-	1	2 (1)	5 (1)	18 (2)	
II	6	8	-	1	3	5 (1)	23 (1)	
III	5	5	-	1	4	5 (1)	20 (1)	
IV	5	6	-	2	4	2 (1)	19 (1)	
Interest								
No	2	7	1	1	2	2	15	27.3
Uncertain	1	-	-	-	1	2	4	7.3
Perhaps	-	-	-	1	-	-	1	1.8
Not Indicated	1	1	-	-	-	1	3	5.5

TABLE 70

TEACHERS INTERESTED IN WORKING WITH FIELD EXPERIENCE STUDENTS

	Junior	Senior	Combined Junior and Senior	Total Number
City	6, 8, 9, 10, 11, 19, 31, 33 (7)	17, 20 (24)	–	10 (2)
Rural	38, 40, 80, 82, 92, 93, 98, 101, 117, 141, 150	86, 110, 149 (148)	37, 52, 81, 83, 105 107, 137, 138 (103)	22 (2)
Total Number	19 (1)	5 (2)	8 (1)	32 (4)

Note. Entries in City and Rural, excluding Total Number, are codes referring to individual teachers; parenthetical entries indicate possible interest.

181

182

TABLE 71

YEARS OF TEACHING EXPERIENCE

	N	Junior			Senior		Combined Junior and Senior	Total	%	
		City	Rural	Independent	City	Rural	Rural			
		12	19	1	4	6	12	55		
1		-	2	1	-	1	1	5	9.1	
2		1	3	-	1	-	3	8	14.5	
3		-	-	-	-	-	1	1	1.8	
4		-	2	-	1	-	2	5	9.1	
5		2	2	-	-	-	1	5	9.1	43.6
6		-	2	-	-	-	-	2	3.6	
7		1	2	-	-	1	-	4	7.3	
8		-	-	-	-	-	1	1	1.8	
9		-	-	-	2	-	-	2	3.6	
10		3	1	-	-	-	1	5	9.1	25.4
11		-	-	-	-	-	1	1	1.8	
12		-	-	-	-	1	1	2	3.6	
13		1	-	-	-	-	-	1	1.8	7.2
16		-	-	-	-	1	-	1	1.8	
17		1	-	-	-	-	-	1	1.8	
18		1	-	-	-	-	-	1	1.8	
19		-	-	-	-	1	-	1	1.8	
20		-	1	-	-	-	-	1	1.8	9.0
21		-	1	-	-	-	-	1	1.8	
22		-	-	-	-	-	1	1	1.8	
23		-	2	-	-	-	-	2	3.6	
24		-	1	-	-	-	-	1	1.8	
25		1	-	-	-	-	-	1	1.8	10.8
26		1	-	-	-	1	-	2	3.6	3.6

TABLE 72

YEARS OF TEACHER EDUCATION

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
N	12	19	1	4	6	13	55	
2	1	-	-	-	-	-	1	1.8
3	-	1	-	-	-	1	2	3.6
4	6	12	1	2	-	8	29	52.7
5	5	3	-	2	3	3	16	29.1
6	-	1	-	-	2	1	4	7.3
9	-	-	-	-	1	-	1	1.8
Not Indicated	-	2	-	-	-	-	2	3.6
Average Years Training	4.24	4.24	4.00	4.50	6.00	4.31	4.47	

TABLE 73

DEGREES HELD BY BIOLOGY/LIFE SCIENCE TEACHERS

	Junior			Senior		Combined Junior and Senior		% of Teachers
	City	Rural	Independent	City	Rural	Rural	Total	
N	12	19	1	4	6	13	55	
B.Ed.	5	10	-	1	3	6	25	45.5
B.A.	-	3	1	1	-	1	6	10.9
B.Sc.	6	6	-	4	2	4	22	40.0
M.Ed.	-	-	-	-	3	-	3	5.5
M.A.	1	-	-	-	-	-	1	1.8
M.Sc.	-	-	-	-	1	-	1	1.8
Ph.D.	-	-	-	-	1	-	1	1.8
Other	1	-	-	1	-	1	3	5.5
None	-	4	-	-	-	2	6	10.9
Not Indicated	1	-	-	-	-	-	1	1.8
Total Degrees	13	19	1	7	10	14	69	
Average Number of Degrees	1.18	1.00	1.00	1.75	1.67	1.08	1.19	
Number of Teachers								
with 1 Degree	9	11	1	1	3	8	33	60.0
with 2 Degrees	2	4	-	3	2	3	14	25.5
with 3 Degrees	-	-	-	-	1	-	1	1.8
with no Degree	-	4	-	-	-	2	6	10.9

TABLE 74

INSTITUTION OF TRAINING

	Junior			Senior		Combined Junior and Senior	
	City	Rural	Independent	City	Rural	Rural	Total
N	12	19	1	4	6	13	55
University of Alberta	4	6	-	2	3	2	17
University of Calgary	-	7	-	1	1	4	13
University of Lethbridge	4	5	-	2	-	7	18
Other Canadian Universities	1	1	-	1	-	-	3
U.S.A. Universities	2	1	1	1	3	3	11
Other	2	-	-	-	-	1	3

TABLE 75

TEACHING MAJORS

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
N	12	19	1	4	6	13	55	
Biology	7	10	-	4	6	9	36	65.5
English	-	1	-	-	1	-	2	3.6
Mathematics	2	1	-	-	-	1	4	7.3
Physical Education	5	2	-	-	-	1	8	14.5
Physical Sciences	1	3	1	-	2	5	12	21.8
Social Studies	1	4	-	-	1	-	6	10.9
Other	3	3	-	1	1	1	9	16.4

191

192

TABLE 76

TRAINING IN BIOLOGY METHODS AND INTEREST IN FURTHER STUDY

	Junior			Senior		Combined Junior and Senior		
	City	Rural	Independent	City	Rural	Rural	Total	%
N	12	19	1	4	6	13	55	
Biology Methods								
Beginning	6	11	1	2	2	9	31	56.4
Advanced	3	3	-	4	4	3	17	30.9
Interest in Further Study								
Biology/Life Science	9	11	1	1	2	8	32	58.2
methodology	(1)[a]					(1)	(2)	(3.6)
Graduate Study								
Yes	5	6	-	1	1	5	18	32.7
In Education	-	-	-	-	-	1	1	1.8
In Biology	-	-	-	1	1	-	2	3.6
Uncertain	-	1	-	-	1	3	5	9.1
No	5	11	1	2	1	3	23	41.8

[a]Parenthetical entries indicate possible interest

TABLE 77

NUMBER OF SEMESTERS TRAINING IN BIOLOGY AND RELATED AREAS

	No. of Teachers with no Courses Reported	Junior						Senior				Combined Junior and Senior		Total	$\bar{X}$
		City		Rural		Independent		City		Rural		Rural			
		Total	$\bar{X}$	Total	$\bar{X}$	Total	$\bar{X}$	Total	$\bar{X}$	Total	$\bar{X}$	Total	$\bar{X}$		
Biology	11	35	2.92	40	2.11	-	-	22	5.50	39	6.50	54	4.15	190	3.45
Botany	24	17	1.42	21	1.11	-	-	8	2.00	23	3.83	21	1.62	90	1.64
Zoology	16	46	3.83	42	2.21	-	-	16	4.00	25	4.17	50	3.85	179	3.25
Chemistry	23	18	1.50	15	0.79	3	3.00	6	1.50	4	0.67	34	2.62	80	1.45
Other Related Areas	38	7	0.58	9	0.47	-	-	5	1.25	4	0.67	6	0.46	31	0.56
Total	7	123	10.25	127	6.68	3	3.00	57	14.25	95	15.83	165	12.69	570	10.36

TABLE 78

COURSES IN BIOLOGY AND RELATED AREAS REPORTED BY SENIOR LEVEL TEACHERS IN RURAL LOCATIONS (N = 6)

Area	Course	Number of Teachers Reporting Study	Total Semesters	Average Semesters
Biology	Introductory	4	7.67	1.28
	Genetics	5	16.33	2.72
	Evolution	2	2.33	0.39
	Ecology	3	11	1.83
	Biology History	1	1	0.17
	Biology Techniques	1	1	0.17
Botany	Introductory	3	3.67	0.61
	Plant Anatomy	1	0.67	0.11
	Plant Physiology	2	2.67	0.45
	Plant Ecology	1	8	1.33
	Field Botany	2	5	0.83
	Thallophytes	1	0.67	0.11
	Spermatophytes	1	0.67	0.11
	Alta. Class. Vascular	1	1	0.17
	Alta. Class. Nonvascular	1	1	0.17
Zoology	Introductory	3	3.67	0.61
	Comp. Vert. Anatomy	3	5	0.83
	Animal Physiology	1	0.67	0.11
	Invertebrates	2	3	0.50
	Animal Ecology	2	2.33	0.39
	Embryology	1	3	0.50
	Mammology	1	1.33	0.22
	Entomology	1	2	0.33
	Ornithology	1	0.67	0.11
	Icthyology	1	0.67	0.11
	Alta. Vert. Survey	1	1	0.17
	Ethology	1	1	0.17
	Animal Behavior	1	1	0.17
Chemistry	Organic	2	4	0.67
Other Related Areas	Conservation Education	1	3.33	0.56
	Genetic Psychology	1	1	0.17

TABLE 79

COURSES IN BIOLOGY AND RELATED AREAS REPORTED BY SENIOR LEVEL TEACHERS IN URBAN LOCATIONS (N = 4)

Area	Course	Number of Teachers Reporting Study	Total Semesters	Average Semesters
Biology	Introductory	4	6	1.50
	Genetics	3	3	0.75
	Evolution	2	2	0.50
	Ecology	4	5	1.25
	Biosystematics	1	1	0.25
	Biological Oceanography	1	0.67	0.17
	Seminar - Mammalians	1	2	0.50
	Advanced Seminar	1	1	0.25
Botany	Introductory	1	1	0.25
	Plant Anatomy	1	2	0.50
	Plant Physiology	1	2	0.50
	Plant Ecology	1	2	0.50
	Field Botany	1	1	0.25
Zoology	Introductory	3	3	0.75
	Comp. Vert. Anatomy	3	3	0.75
	Vertebrates	1	1	0.25
	Animal Physiology	2	2	0.50
	Invertebrates	2	3	0.75
	Parasitology	1	0.67	0.17
	Mammology	1	0.67	0.17
	Human Physiology	1	2	0.50
	Zooplankton	1	0.67	0.17
Chemistry	Organic	3	3	0.75
	Inorganic	1	3	0.75
Other Related Areas	Biophysics	1	0.67	0.17
	Biological Curriculum	1	2	0.50
	Chemical Oceanography	1	0.67	0.17
	Physical Oceanography	1	0.67	0.17
	Research Statistics	1	1.33	0.33

TABLE 80

COURSES IN BIOLOGY AND RELATED AREAS REPORTED BY

JUNIOR - SENIOR LEVEL TEACHERS IN RURAL LOCATIONS (N = 13)

Area	Course	Number of Teachers Reporting Study	Total Semesters	Average Semesters
Biology	Introductory	9	14	1.08
	Genetics	10	12	0.92
	Evolution	4	4	0.31
	Ecology	10	13	1.00
	Biosystematics	1	1	0.08
	Cell	1	1	0.08
	Cell Physiology	1	1	0.08
	Genetics of Man	1	1	0.08
	Advanced Genetics	1	1	0.08
	Microbiology	1	1	0.08
	Natural Resource Conservation	1	1	0.08
	Seminar	1	4	0.31
Botany	Introductory	6	8	0.62
	Plant Anatomy	4	4	0.31
	Plant Physiology	3	3	0.23
	Plant Ecology	3	3	0.23
	Field Botany	2	2	0.15
	Vasc. Plants - Morph. & Taxon.	1	1	0.08
Zoology	Introductory	6	9.67	0.74
	Comp. Vert. Anatomy	5	7	0.54
	Vertebrates	5	9	0.69
	Animal Physiology	3	4	0.31
	Invertebrates	3	2.67	0.21
	Animal Ecology	2	2	0.15
	Embryology	1	2	0.15
	Parasitology	3	3	0.23
	Mammology	1	1	0.08
	Entomology	1	1	0.08
	Ornithology	1	1	0.08
	Icthyology	1	1	0.08
	Advanced Invertebrates	1	1	0.08
	Comp. Human Physiology	1	2	0.15
	Human Physiology	1	2	0.15
	Animal Behavior	1	2	0.15
Chemistry	Biochemistry	4	6	0.46
	Organic	10	20.50	1.58
	Inorganic	1	4	0.31
	Analytic	1	3	0.23
Other Related Areas	Behavior Genetics	1	1	0.08
	Comp. Behavior Lab.	1	1	0.08
	Human Anatomy & Kinesiology	1	2	0.15
	Geology	1	1	0.08
	Physiological Psychology	1	1	0.08

TABLE 81

COURSES IN BIOLOGY AND RELATED AREAS REPORTED BY JUNIOR LEVEL TEACHERS IN URBAN LOCATIONS (N = 12)

Area	Course	Number of Teachers Reporting Study	Total Semesters	Average Semesters
Biology	Introductory	10	18	1.50
	Genetics	6	9	0.75
	Evolution	4	4	0.33
	Ecology	4	4	0.33
Botany	Introductory	5	6	0.50
	Plant Anatomy	3	3	0.25
	Plant Physiology	2	2	0.17
	Plant Ecology	3	3	0.25
	Field Botany	3	3	0.25
Zoology	Introductory	7	9	0.75
	Comparative Vertebrate Anatomy	6	7	0.58
	Vertebrates	4	5	0.42
	Animal Physiology	6	11	0.92
	Invertebrates	6	8	0.67
	Animal Ecology	1	1	0.08
	Embryology	2	2	0.17
	Histology	1	0.67	0.06
	Cytology	1	0.67	0.06
	Cell Physiology	1	2	0.17
Chemistry	Biochemistry	4	6	0.50
	Organic	6	10	0.83
	Inorganic	1	2	0.17
Other Related Areas	History & Philosphy of Science	1	2	0.17
	Anthropology	1	2	0.17
	Anatomy	1	1	0.08
	Physiology	1	1	0.08
	Kinetics	1	1	0.08

Note. The only courses reported by the junior level teacher in an urban independent school were Biochemistry (1 semester) and Organic Chemistry (2 semesters).

TABLE 82

COURSES IN BIOLOGY AND RELATED AREAS REPORTED BY JUNIOR LEVEL TEACHERS IN RURAL LOCATIONS (N = 19)

Area	Course	Number of Teachers Reporting Study	Total Semesters	Average Semesters
Biology	Introductory	11	17	0.89
	Genetics	6	10	0.53
	Evolution	3	4	0.21
	Ecology	3	4	0.21
	Taxonomy	1	1	0.05
	Molecular & Cellular	1	1	0.05
	Systematics	1	1	0.05
	Human Affairs	1	1	0.05
	Seminar	1	1	0.05
Botany	Introductory	6	8.67	0.46
	Plant Anatomy	3	5	0.26
	Plant Physiology	2	3	0.16
	Plant Ecology	1	1	0.05
	Field Botany	2	2	0.11
	Bryophytes	1	1	0.05
Zoology	Introductory	6	10	0.53
	Comp. Vert. Anatomy	4	7	0.37
	Vertebrates	1	3	0.16
	Animal Physiology	5	8	0.42
	Invertebrates	4	5	0.26
	Animal Ecology	2	2	0.11
	Embryology	1	2	0.11
	Mammology	1	1	0.05
	Entomology	1	2	0.11
	Ornithology	1	1	0.05
	Histology	1	1	0.05
Chemistry	Biochemistry	1	2	0.11
	Organic	6	12	0.63
	Inorganic	1	1	0.05
Other Related Areas	Human Anatomy	1	1	0.05
	Growth & Development	1	1	0.05
	Exercise Physiology	1	1	0.05
	Science Methodology	2	3	0.16
	Animal Psychology	1	1	0.05
	Biological Psychology	1	1	0.05
	Physiological Psychology	1	1	0.05

APPENDIX B

MAP OF ZONE 6 IN ALBERTA